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A Suggested Unit Course

MARINE SHEET METAL SHOP AND FIELD WORK

INSULATION AND SHEATHING

(For Beginning and Advanced Instruction)

Bulletin 345-G

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF PUBLIC INSTRUCTION
HARRISBURG
1942

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Vocational Training
for
War Production Workers

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INSULATION AND SHEATHING

(For Beginning and Advanced Instruction)

Bulletin 345-G

Prepared by

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF PUBLIC INSTRUCTION
DIVISION OF INDUSTRIAL EDUCATION

In Cooperation With

SCHOOL DISTRICT OF PHILADELPHIA
SHIPBUILDING YARDS IN THE PHILADELPHIA AREA
and
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FEDERAL SECURITY AGENCY

Commonwealth of Pennsylvania
DEPARTMENT OF PUBLIC INSTRUCTION
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August, 1942

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Foreword

This suggested unit course is intended for training of beginners, and the training of advanced shop and field workers in marine insulating and sheathing practices. It is one of a series published under the general grouping, "Marine Sheet Metal."

Insulating and sheathing a modern vessel require almost as many man hours as the fabrication and installation of ventilation. The lifting, fabrication, and erection of support fittings, sheathing, and mouldings are classified as a division of the marine sheet metal trade. The marine metal worker prepares for the installation of insulating materials and helps to secure the actual material in place by finally covering it over with sheet metal sheathing. Some other trade group may have charge of actually placing the insulating material; yard practices differ.

The units have been organized and developed by men from the marine drafting room, sheet metal fabricating shop, and shipyard installation and inspection service, with necessary professional assistance. The detail drawings and shop specifications which represent current practices, are the background for instruction. These have been developed from large assembly drawings.

Appreciation is extended to the foremen, mechanics, and draftsmen who assisted in the preparation and criticism of the materials presented in this unit. The assistance of Albert Muir, Charge Draftsman, Hull Fitting and Engineering Department, Cramp Shipbuilding Company, and Ernest H. Cannon, Assistant Foreman, Sheet Metal Shop, Cramp Shipbuilding Company, is gratefully acknowledged. Mr. Muir developed drawings and specifications; Mr. Cannon supplied much of the technical information.

Acknowledgment is extended to Mr. Charles F. Bauder, Director of Vocational Education, and to Mr. William E. Brunton, Assistant Director in charge of War Production Training, of the School District of Philadelphia, for cooperation and assistance in the development of this material. The cooperation of supervisory personnel of the Mastbaum Vocational School and Annex is acknowledged.

This Bulletin was prepared at the Philadelphia Field Curriculum Laboratory of the Pennsylvania Department of Public Instruction. Wayne W. Thompson, Adviser, Division of Industrial Education, supervised the preparation of materials at the Laboratory. This work was completed under the direction of Charles F. Zinn, Adviser, Division of Industrial Education, and under the general supervision of Paul L. Cressman, Director, Bureau of Instruction, and Urwin Rowntree, Chief, Division of Industrial Education.

FRANCIS B. HAAS

Superintendent of Public Instruction

August, 1942

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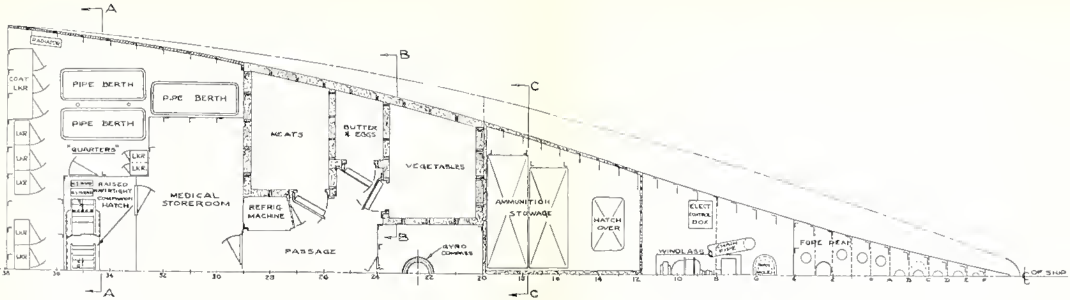

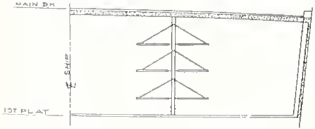

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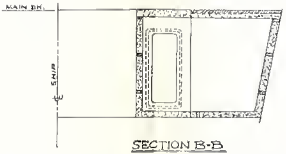

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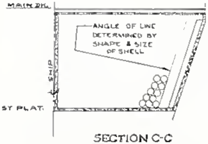


SECTION C-C

"TYPICAL LAYOUT OF CRUISER SECTION FOR INSULATION AND SHEATHING"

SHOP EQUIPMENT AND TOOLS FOR TRAINING FIFTEEN WORKERS

In the main, any well equipped sheet metal shop is more than adequately prepared for training workers in the fabrication of sheathing and moulding.

The following are minimum essentials:

EQUIPMENT

1	Beading Machine
1	96" Brake
1	Electric Drill Capacity 1/4 Stock, 1800 R.P.M.
1	Hand Punch #2 (Large)
1	Hand Punch, Small
1	96" Squaring Shear
1	Stock Shear
1	Throatless Shear, Capacity 1/8"
6	Vise, 4" Machinists' Welding Service

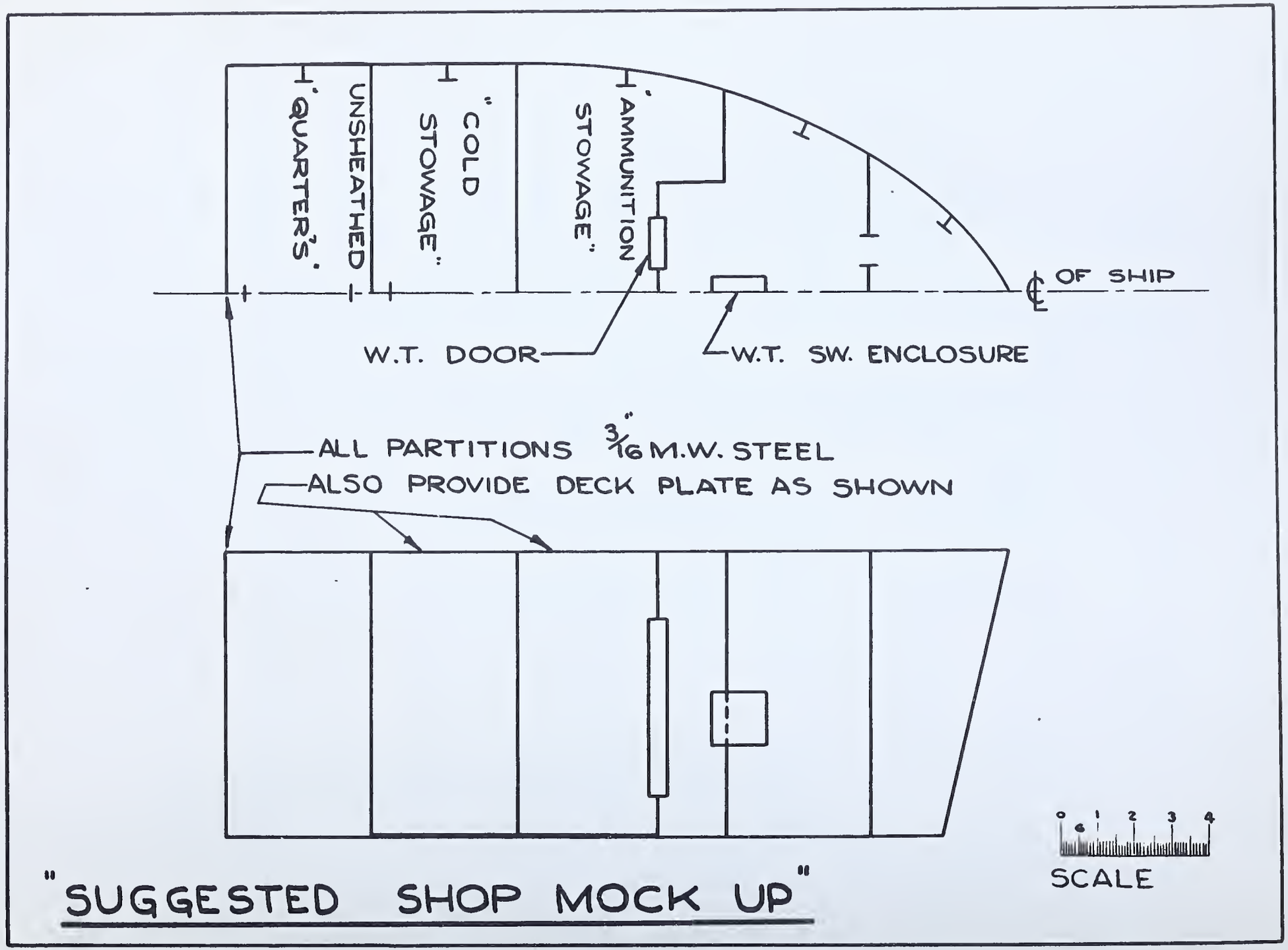
Note accompanying sketches of specialized equipment for production shops

TOOLS

6	Awls, 4"
1	Bolt Cutter, 24"
6	Cape Chisels, 1/2" x 6"
24	C-Clamps, 3"
6	Countersinks
10	Dividers, 8"
6	Drills, Sets, 1/8" to 1/4" by 1/16ths
12	Files, assorted
2	U.S. Metal Gauge #2
4	Hack Saw Frames, 24", Adjustable
15	Tinners' Hammers, 8 oz.
4	Levels, 24"
6	Mallets, Composition, $2\frac{1}{2}$" x $5\frac{1}{2}$"
15	Center Punches
4	Hollow Punch sets, 1/8" to 1/2" by 1/16 ths
6	Rules, 12", Steel
15	Rules, 6', Folding
8	Screwdrivers, 8", to be altered in shop for Quilting Screws
8	Screwdrivers, 6"
15	Scribers
2	prs. Shears, Aviation, 8"
2	prs. Shears, Circular, 4" cut
15	prs. Shears, Straight, 4" cut
4	Squares, Combination, 12"
1	Stock and Dies
6	Straight Edges, 4'
6	Straight Edges, 6'

MATERIALS REQUIRED FOR TRAINING FIFTEEN WORKERS

350 ft. Angle, 14 Gauge M. W. Steel, 3/4" x 3/8"
100 ft. Angle, M. W. Steel, 1-1/8" x 1-1/8"
100 ft. Angle, M. W. Steel, 1-3/16" x 3/4" x 1/8"
100 ft. Angle, M. W. Steel, 1½" x 3/4" x 1/8"
200 ft. Angle, M. W. Steel, 1½" x 1½" x 3/16"
200 ft. Angle, M.W. Steel, 2" x 2" x 3/16"
100 ft. Angle, M.W. Steel, 2½" x 2" x ¼"
10 ft. Asbestos Sheet, 1/16"
350 ft. Bar, M. W. Steel Flat, 5/8" x 1/8"
200 ft. Bar, M. W. Steel Flat, 1¼" x 1/8"
1 gr. Bolts & Nuts, Rd. Head, 3/8" diam. x 1-3/4" long
5 gal.Compound, Non-corrosive Sealing
15 pcs.Crayon, Yellow Marking
6 rls.Paper, Resin-Coated Template, 8' wide
250 ft. Plate, M. W. Steel, 3" x 1/8"
200 ft. Plate, M. W. Steel, #14 USSG x 3-5/16"
2 pcs.Plate, M. W. Steel, 1/8" x 48" x 6'-0"
200 ft. Plate, M. W. Steel Flat, #14 USSG x 8"
10 lbs.Rivets, 2 lb, 3/16" B/ck L = 5/8"
6 gr. Screws, Oval-head, cadmium finish, #10 Self-tapping
400 Screws, Quilting 2-7/16" steel
40 pcs.Steel, #26 Galvanized Sheet, 3' x 8'
150 ft. Steel, M. W. 1/4" x 3½"
100 Washers, Steel Cad. plated, Threaded #12 28 NF 2, 1" x 1/8"

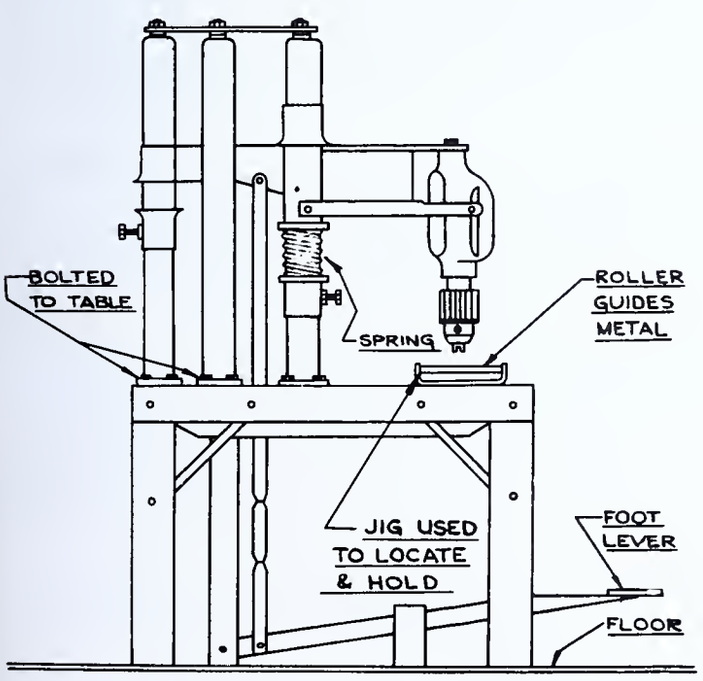

"QUARTER'S"
UNSHEATHED
"COLD STOWAGE"
"AMMUNITION STOWAGE"
℄ OF SHIP
W.T. DOOR
W.T. SW. ENCLOSURE
ALL PARTITIONS 3/16" M.W. STEEL
ALSO PROVIDE DECK PLATE AS SHOWN
0 1 2 3 4
SCALE
"SUGGESTED SHOP MOCK UP"

SPECIAL PRODUCTION DEVICES

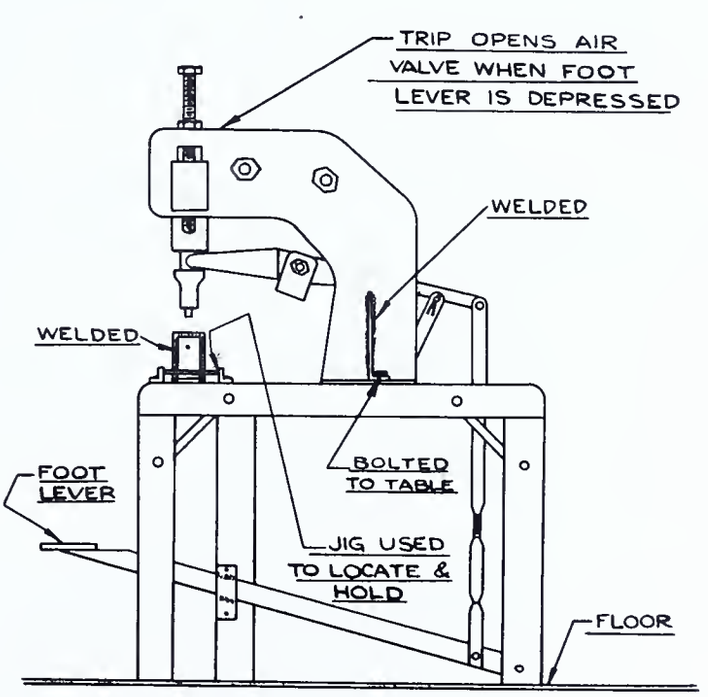
In production shops special tools are frequently devised to expedite the processes of fabricating or assembling various parts. The saving of a few seconds on a single operation can provide extra production which is most essential in manufacturing. Simple tool-holding devices may eliminate wasteful turns, lifts, adjustments, and possible errors.

Two such devices are shown here. The drill set-up leaves the hands free to place and remove the stock from a jig on the table. The jig assures duplicate drilling. As the foot lever is depressed the drill begins to operate and to lower and drill through the work. A special drill is used which has a countersink shoulder at the top so that one operation drills and countersinks.

The riveting machine likewise is operated by a foot pedal. This device provides solid support in backing up the rivet and enables a careful application of the clip to the angle which would be very difficult without such arrangement.



"DRILL PRESS"



"RIVETING MACHINE"

GENERAL PROCEDURE IN INSTALLING INSULATION AND SHEATHING

The trainee in this field should know in a general way something of the routine of installing sheathing and insulation. Because as a helper he may be assigned to any one of the operations of this unit, a background knowledge is essential for an intelligent approach to these tasks.

The "lifting" (or measuring), the fabrication, and the installation of support fittings will be discussed in Part 1. The actual installation of the filler material for insulation is discussed in Part 2. In most yards the metal worker does not do this. To the trade, however, the operations are grouped as "insulation and sheathing", since the outer metal, the "sheathing", actually forms part of the insulation of the ship. Part 3 contains procedures in installing Mouldings, and Part 4 the Detail Drawings, Descriptions, and Questions.

When the ship is designed, each area is identified by number on the master plan of the vessel; and all orders and material for that section will be so tagged.

When an area of a vessel is ready for insulation, it is examined by the "'leadingman'-for-insulating". He will mark on the surfaces to be insulated the thickness and type of insulation required. He will then assign a "sketcher" to sketch and measure the surfaces and to list by number, size, and type the support pieces required.

A bill of material is drawn up and sent to the shop for fabrication. Various types of support fittings have been fabricated beforehand; and in accordance with the order, the shop will draw from its stock the types required and cut them to the length needed. Clips are already in place every twelve inches; and it is necessary to add clips, if required, only at the ends of the specified lengths. See Details.

Material is then grouped and tagged by area numbers and sent to the field office to await installation in the ship. The insulation lead-man has been notified; and when he directs, the installation mechanic secures the material and installs it in the compartment. To summarize, the steps are as follows:

1. Leadingman for insulation takes blueprint and designates on the bulkhead surface the thickness and type of insulation required.

2. "Sketcher" of gang lists on a standard form the sizes and types of support pieces necessary.

3. This list is entered in field office, and triplicate copies are then prepared. One copy remains in field office, one goes to the shop, and one to the leadingman. They are filed according to area number.

4. The shop copy is used in fabricating the specified boundary material, following a set of standard details.

5. Fabricated material is grouped by area number and delivered to the field office. The insulation leadingman is notified, and at his order it will be installed.

6. The installation mechanic will at that time secure the material and install it in the specified compartment.

7. When the angle and corner support fittings are installed, the Pin-boy will mark and install quilting pins (screws). These are held in place with a special hollow holding device by the Pin-boy while being welded.

8. Inspection Note:

   These installations are under constant inspection, and successive steps await approval by the inspectors.

9. Welds are cleaned and painted, as are all other surfaces not accessible after installation. All surface of area which is to be insulated must be thoroughly cleaned of mill scale, oxidation, etc., then primed with a standard metal primer in accordance with the painting schedule for steel structure.

   When the primer is dry, two coats of a special sizing composition is applied and allowed to dry. This is made up with bakelite varnish as a base, with zinc chromate pigment for aluminum structure, and red lead pigment for steel structure. Plain bakelite varnish or a zinc chromate paint is applied to the insulation side of either aluminum or steel sheathing.

10. Insulation material is installed.

11. Sheathing is fitted and installed.

12. Moulding is fitted and installed.

PART I — SHEATHING

FABRICATION AND INSTALLATION OF SUPPORT FITTINGS

1. Flat Bar Clips
2. Flange Clips
3. Support Angles
4. Angle Supports
    a. For Stock
    b. For Job Specification
5. Angle Support Fittings
6. Steel Flat Bars
7. Flanged Sheets
8. Corner Support Fittings
9. Collar Plates
10. Quilting Screws
11. Commercial Bar-type Fittings and Clips
12. Support Bars for Cold Stowage Sheathing
13. Deck Sheathing Supports

INTRODUCTION

Sheathing is a covering which provides closure, finish, and protection to the insulated surfaces.

For general protection and closure 1/32" aluminum or 26 gauge (.01875) mild steel galvanized is usually specified. For sound proofing installations .032" sheet copper-nickel alloy that is perforated with holes spaced regularly on specified centers for purpose of sound absorption is used. Modern specifications may also call for #24 USSG Galvanealed Sheet Steel with .095" diameter perforations on 3/16" centers.

Sheathing must be handled carefully to avoid surface buckles, kinks, or edge bends; and when it is installed it should form a plane.

There is a growing trend toward use of sheathing which is made of non-metallic substances. Various manufacturers of glass, asbestos, cork, and other materials offer several types of "board" which are usually applied by joiners under sub-contract. Scarcity of metal is one reason for the rapid growth of these applications. Cost, textures, availability, and weight are other factors. Freqently these materials provide insulative qualities which cause added favorable consideration.

This unit will discuss procedures for fabricating and installing support fittings, and for lifting, fabricating, and installing metallic sheathing. Removal and re-installation of sheathing are also presented. The sheet metal worker is concerned only with these skills, since non-metallic types are usually installed by other trades.

FABRICATE FLAT BAR CLIPS

Objectives:

1. To understand the purpose of flat bar clips.
2. To learn how to fabricate flat bar clips.

General Information:

Details 1-A, 1-E, Piece No. 1. Detail 1-Q (Types 1, 2, 5, 6)

These support the angle which holds the sheathing. Flat bar clips are parallel to the sheathing and are spaced at 12" centers. They are riveted to the angle, and then welded to the deck or bulkhead.

Note: In types 5 and 6 the flat bar clip is placed alternately with flanged clips for greater rigidity at a corner, particularly where insulation is more than 2" thick.

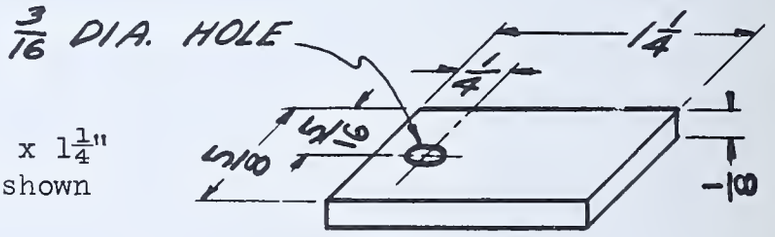
They are made of M.W. steel, 5/8" flat bar, 1-1/4" long.

Note: This length will vary according to width of moulding.

The number of clips needed is determined and secured from the stock room. They have been made by shearing flat stock to the length required and punching hole as shown in sketch.

Specifications:

Make 4 flat bar clips 5/8" x 1/8" x 1¼" M. W. steel, 3/16" diam. hole as shown in sketch



FLAT BAR CLIP

Tools Needed:

Rule
Combination Square
Center Punch

Equipment needed:

Shear
Hand punch

Material:

5/8" x 1/8" flat bar M.W. steel at least 6" long.

Procedure:

1. Determine size, type, and number of clips required.
2. Set gauge of shear to length required.
3. Shear metal to length.
4. Layout and center punch for 3/16" hole.
5. Punch hole.
6. Deburr metal.

Questions:

1. Identify on Sketch #1-A the flat bar clip.
2. What is its purpose?
3. What is its position in relation to the sheathing?
4. How is it attached to the deck or bulkhead?
5. How far apart are the F.B. clips spaced?
6. Of what material are the F.B. clips usually made?

FABRICATE FLANGE CLIPS

Objectives:

1. To understand the functions of flange clips.
2. To learn how to fabricate flange clips.

General Information:

Flanged clips, in general, are the same for all installations; their length will vary according to the thickness of the insulation. They are intended to support, at 12" centers, the angle to which sheathing will be fastened. After they are attached to the angle, they are welded to the deck or bulkhead. Note their application under various conditions in the following details:

Detail 1-H Typical application of clip as angle support.
Detail 1-B Clip used for corner plate stiffening at overhead and vertical outside corners.
Detail 1-D Clip used for angle support at overhead and vertical inside corners.
Detail 1-E Clip used to support sheathing where access is sufficient to permit screw fastenings to be attached.
Detail 1-F Where depth is limited and 1-E not practicable.
Detail 1-Q Types 3 and 4: Where depth of insulation is over 2" the flanged clips are alternately turned for greater rigidity.
Types 5 and 6: At corners, Flanged Clips are alternated with Flat Bar Clips for greater rigidity, particularly necessary where insulation is more than 2" thick.

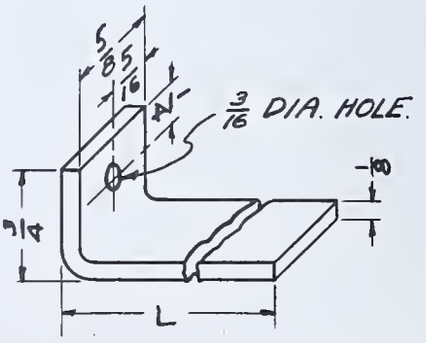
These are usually secured from stock. They are made of M.W. steel 5/8" x 1/8" flat bar stock which has been cut to length, punched as indicated in sketch, and flanged.

Schedule of stock lengths "L" for various insulation thickness.

			1/8" al. angle	#14 sheet steel flange
Pc. #7	for 1"	Insulation	L = 7/8"	15/16"
" #8	" 2"	"	L = 1-7/8"	1-15/16"
" #9	" 3"	"	L = 2-7/8"	2-15/16"
" #10	" 4"	"	L = 3-7/8"	3-15/16"

Specifications:

Make 2 flanged clips for 2" insulation*.
Punch 3/16" Diam. Rivet Hole as in sketch.
*Since details show Aluminum Angles, these units will specify same.



FLANGED CLIP

Tools needed:

Rule
Combination Square
Center punch

Equipment needed:

Shear
Hand punch
Brake

Material:

5/8" x 1/8" flat bar M.W. steel at least 5" long.

Procedure:

1. Shear stock to length required.

   (Note: The stretch of the metal in bending requires that the length of the blank be made the total of the inside measurements, thus 5/8" + 1-3/4" or 2-3/8" long, rather than 2-5/8" for this piece.)

2. Layout and center punch for 3/16" hole.

3. Punch hole.

4. Bend metal on brake to form clip as shown.

Questions:

1. What is the purpose of these clips?

2. About how far apart should clips be spaced?

3. How are they secured in place?

4. What determines the length of the flanged clip?

5. Why is the length always less than the thickness of the wall it serves?

6. When are flanged clips put alternately at right angles to each other as in type 4? Why?

7. Where is this type of clip used?

8. What are the various piece numbers?

9. What kind of material is used?

10. What is the overall length for piece #10 before flanging?

FABRICATE SUPPORT ANGLES

Objectives:

1. To learn the purpose and relationship of angles as a support for sheathing
2. To learn how to fabricate support angles.

General Information:

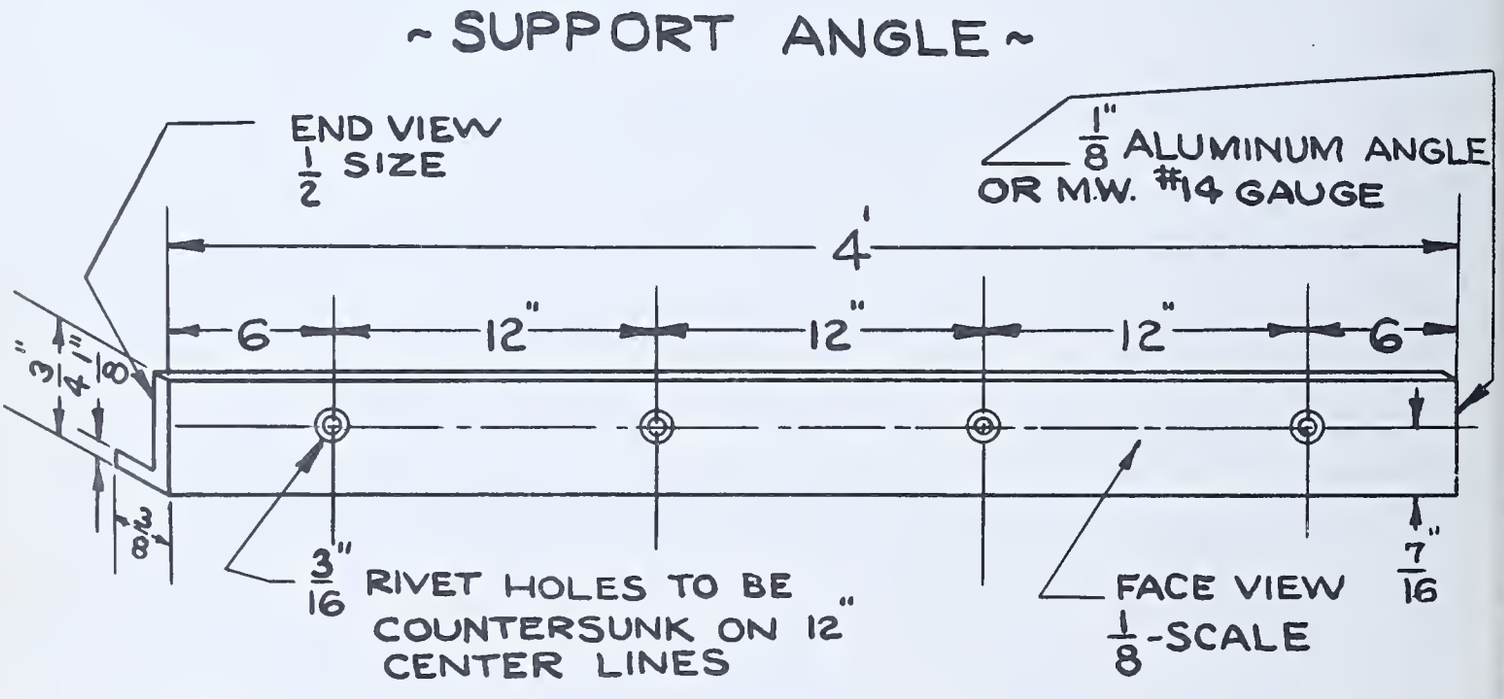
Details 1-A, 1-D, 1-E, 1-F, 1-H, 1-J

Support angles are used to provide continuous support for the sheathing (and moulding) at the boundaries of all areas. They are usually made of aluminum 1/8" thick, which is purchased commercially as angle stock. However, M. W. steel angles of 14 gauge stock is being used for this purpose because of the increasing scarcity of the lighter metal. This is formed in the yard, although it may likewise be purchased as an angle.

The metal comes in angles or strips as long as twenty feet. The yard cuts them into stock lengths of four and eight feet, and then drills and countersinks them.

Specifications:

3/16" Rivet holes are to be on 12" centers and countersunk as shown in detail -
Aluminum angle 1/8" or M.W. steel 14 gauge: 3/4" x 3/8" x 4' long.



Tools needed:

Rule
Scriber
Center punch
Countersink

Equipment needed:

Brake
Hand punch
Drill

Materials:

One piece 14 gauge x 1-1/16" M.W. steel 4'-0" long, or
One piece 3/4" x 3/8" x 1/8" aluminum angle 4'-0" long.*

Procedure:

1. Cut stock to length.

*2. Set flanging brake to depth.

*3. Flange metal to 90°.

4. Layout and center punch holes for rivets.

5. Punch rivet holes.

6. Countersink

Questions:

1. Why are the rivet holes laid out after flanging?

2. Which side of the angle is countersunk? Why?

3. Why are aluminum angles preferred?

*Usually purchased already formed

FABRICATE ANGLE SUPPORT

Objectives:

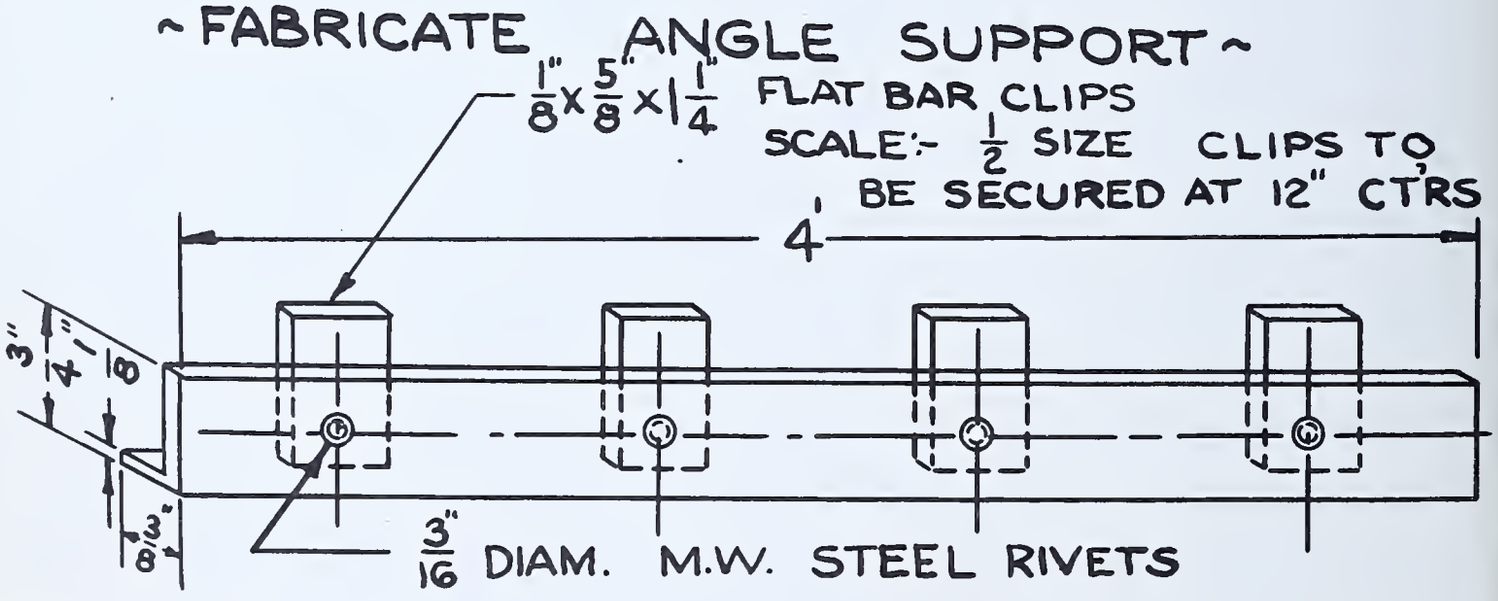
1. To understand the need for various adaptations of angle supports.
2. To learn the types of angle supports used.
3. To learn how to fabricate angle supports for (a) stock supply, (b) job application.

General Information:

A careful study of drawing 1-Q will show the assemblies of angles and clips in accordance with various conditions on the job. See general information, Jobs 1 and 2, in the study of this unit.

Although various types of angle supports may be devised by combinations of fittings, the process of fabrication is essentially the same. In each installation, the number, type, and size of fitting required are provided by the "sketcher". The angle supports are made up and kept in stock for application (with necessary job changes) when called for.

When aluminum is used, a fibre tape, asbestos paper, or a non-corrosive compound is placed between the angle and the clip to aid insulation and reduce corrosion.



Specifications:

A. Angle 4' long with 1-1/4" Flat Bar Clips attached per sketch, clips to be secured at 12" centers with M.W. Steel Rivets 3/16" diam. B/ck (Button Head, Countersunk) L = 5/8".
Asbestos paper between any contacting surfaces of bar and clip.
B. Type 1 Angle Support, 40" long.

Tools needed:

Rule
Scriber
Button-head rivet backer
Rivet hammer
Center Punch

Equipment needed:

Beverly shear
Hand punch

Materials:

3/4" x 3/8" x 1/8" Aluminum Angle 4'-0" long. (Made in Job No. 3)
4 Rivets, M.W. Steel 3/16" Diam. B/ck L = 5/8"
Asbestos Paper
4 flat bar clips (Job No. 1)
2 flanged clips (Job No. 2)

Procedure:

A. For stock

1. Secure proper clips for insulation thickness. See specifications.
2. Place asbestos paper between the contacting surfaces of clips and angle.
3. Rivet clips to the angle.
   Caution: Be sure that the flat head of the rivet is firmly backed-up to insure a tight job.

B. For Job Specification: Type 1 bar, 40" long.

4. Secure that length of angle which allows the least waste. Type 1 bars as needed are made from Type 2 stock piles.
5. Find center of length of angle.
6. Measure each side of center one-half the total distance desired.
   Note: If clip spacing at the end will permit, the length is simply measured from an end.
7. Shear each end and re-form if necessary.
8. Secure two flanged clips of proper length.
9. Center punch end holes as in Detail 1-Q. Type 1.
10. Countersink end holes.
11. Place asbestos paper.
12. Rivet flanged clips to ends of angle.
13. Check work for over-all length.

Questions:

1. What is alumilastic? Why is it used?
2. In what way does the Type 1 and Type 2 support differ?
3. Why is it necessary to alternate clips as in Type 4?
4. Where would Types 5 and 6 support fittings be used?

INSTALL ANGLE SUPPORT FITTINGS

Objectives:

1. To learn how to install Angle Support Fittings.

General Information:

The angle support fittings have been prepared for the job in accordance with the "sketcher's" order sheet, and are delivered upon further order to the area of use.

Specifications:

Weld in place the angle supports necessary.

Tools needed:

Holding tongs
Spreader block

Equipment needed:

Welding Service

Materials:

As delivered for area order.
One Type 1 Bar, 40" long, made in Job No. 4b.

Procedure:

1. Separate materials by type and length in accordance with marks on surfaces of area.
2. Mark off on structure with chalk line the location of clips to be welded.
3. Hold angle in place with tongs, square to its surface, and parallel to the boundary.
4. Have welded.
5. Hold firmly until welder gives word.
6. Secure other end.
7. Have intervening clips welded, being sure to hold firmly during welding.

Questions:

1. Why are tongs used to hold the angle?
2. What is the purpose of the spreader block?
3. Why should the clips be held square to the surface of the area?
4. How accurate need the length of the angles be made? The clips?

FABRICATE AND INSTALL STEEL FLAT BAR

Objectives:

1. To understand the purpose of Steel Flat Bars.
2. To learn how to make and install Steel Flat Bars.

General Information:

The steel flat bar is used where insulation is to be carried to the deck. It is welded in place all along its length and at the ends and is known as a "coaming". The work is measured on the job and fabricated in shop. Detail 1-C.

Specifications:

Weld on edge and at ends for watertightness.

Tools Needed:

Rule
Scriber
Center punch
Combination square
Hammer
File
Spreader-block

Equipment Needed:

Squaring shears
Hand punch #2
Welding service
C-clamps

Materials:

#14 USSG Sheet Steel, 1-1/4" x 1/8" x 6'-0". (Length in accordance with conditions).

Non-Corrosive Compound

Procedure:

1. Secure plan and check location for size and interferences.
2. Send plan (or template if required) to shop for fabrication.
3. Shear flat bar stock to length required.
4. Hold in position and have welded. Be sure piece is perpendicular.

Questions:

1. Why make watertight welds at ends on coaming?
2. How accurate should the measurement for length be? Why?
3. Why should a spreader block be used?

FABRICATE AND INSTALL FLANGED SHEET

Objectives:

1. To understand purpose and application of flanged sheet.
2. To learn how to fabricate and install a flanged sheet.

General Information:

Detail 1-K

Made up in stock sizes for various insulation thicknesses, and flanged, ready to be cut to length.

Also known as a boundary angle, this type of flanged sheet is a closing piece which also provides for securing sheathing. Holes for this purpose are drilled after flanged sheet is in place. The weld is intermittent, as specified.

It provides a strong support, is an excellent protective case, and keeps the sheathing clear of the deck and various openings.

Specifications:

Make flanged sheet for 2" insulation.
Detail 1-K and 1-R, Type 2.
No. 14 Sheet Steel flanged sheet.
Non-Corrosive Compound for sealing between welds.

Tools needed:

Hammer
Prick punch
Center punch
Combination square
Tongs or Pliers
Scriber
Screw driver
File
Chalkline and chalk
Spreader block

Equipment needed:

Throatless shear
Drilling machine
Welding service

Materials:

#14 Sheet Steel. 3" x 6' 0" (length to suit classroom or field conditions)
Non-Corrosive Compound

Procedure:

*1. Secure necessary stock from scrap or from stock clerk.

*2. Determine size (length, offset and thicknesses), making necessary deductions for thickness of metal, and cut to length and width. Customarily a small amount (6") over-length is allowed in make-up, later cut to exact size.

*3. Mark location of bends with combination square, scriber center punch.
Note: It is suggested that a sample on small scrap metal be made to check bend allowance.

*4. Bend flanges and check for squareness.

*5. Deburr metal with flat file.

6. Cut to job length and fit as required by obstructions.

7. Mark with chalk line the place of flanged sheet.

8. Clamp or secure angle in position.

9. Have welder weld angle to structure.

10. Apply non-corrosive compound.

Questions:

1. Why is non-corrosive compound used along back edge of flange?

2. Why is the flange turned down to structure, rather than meeting it squarely? Detail 1-K.

3. Why should there be a 6" clearance above deck in this manner?

4. What is an intermittent weld? Why used?

5. What does 1/8" -18" mean in welding specifications?

*These steps have usually been done for stock storage.

FABRICATE AND INSTALL CORNER SUPPORT FITTINGS

Objectives:

1. To understand purpose of Corner Plate.
2. To learn how to make corner plates for stock and to adapt for field.
3. To learn how to install corner plates.

General Information:

External corners are made of a corner plate and rounded to prevent injury. The thicker material gives to the corner a strength that sheathing woul not provide. These fittings are made in shop from stock* (See Procedure steps 1 to 11) and are cut for job conditions as required.

Specifications:

Make M.W. Steel corner plate for 2" insulation.
Details 1-B and 1-R. These call for aluminum;
substitute #14 M.W. Steel. (This substitute will affect length of clips.)
Asbestos paper between clips and plate.

Tools needed:

Combination square
Pencil
Dividers
Hand Punch #2
Center punch
Prick punch
Hammer
File

Equipment needed:

Squaring shear
Power brake
Welding service

Material:

#14 Gauge M.W. Steel Sheet, type as specified.
Flanged clips as length requires.
Rivets

Procedure:

*1. Secure specifications of type required.

2. Shear stock to width and length required.

3. Center punch for brake layout as necessary. See Detail..

4. Layout location of holes and center punch.

5. Punch holes.

6. Deburr metal.

7. Make template with necessary form for the brake hand.

*Steps 1-11 prepared for stock room.

8. Have formed on brake.

9. Insert asbestos paper.

10. Rivet clips.

11. Lift, or secure template, if necessary. (Template usually lifted by Lay-out man)

12. Cut for length as specified.

13. Lay-out and trim for obstructions.

14. Hold in position for welding.

Questions:

1. Why is a rounded corner used?
2. Why is the material thicker than for sheathing?
3. Need we use a spreader block in installing corner plates? Why?
4. Why may a template be necessary?

FABRICATE AND INSTALL A COLLAR PLATE

Objectives:

1. To understand functions of collar plate.
2. To learn how to fabricate and install a collar plate.

General Information:

The collar plate is used to form closures around structural members and to serve as a support for sheathing and moulding. The large piece of sheathing is then simply notched out square and attached to the collar. The collar plate is fabricated in the shop and taken to the ship to be installed.

There are templates provided for the various shapes which will require fitting, and within each type there are templates made for the various dimensions encountered.

A given order will therefore use type and number to convey complete understanding of the exact size and shape required without further "lifting" and measuring.

Specifications:

The collar plates are made of 14 gauge or sometimes of 1/8" M.W. steel, galvanize
Detail 1-L, 1-P. Make and attach type as required.

Tools needed:

Scriber
Combination square
File

Equipment needed:

Square shears
Clamps
Welding service

Materials needed:

14 gauge or 1/8" M.W. Steel to size needed.
Template required for obstruction.

Procedure:

1. Secure standard template of size and shape of collar plate required.
2. Secure material from shop.
3. Transfer shape of template to metal.
4. Cut metal on square shears.
5. Shear flat bar stock to length for bottom. Detail 1-L.

6. Fasten or clamp collar in place to be welded.
   Note: It is highly important that the plane of the entire collar plate be the same so that the sheathing will run in a straight line without bending or buckling.

7. Secure welder to weld collar plate to structure.

8. Weld bar on bottom.

Questions:

1. What is the purpose of the collar plate?
2. How is the collar plate held in place?
3. What is its material and thickness?
4. What is its position in relation to the sheathing?
5. Does it go on before or after the sheathing?

FABRICATE AND INSTALL QUILTING SCREWS

Objectives:

1. To understand the purpose and application of Quilting Screws.
2. To learn how to fabricate and install Quilting Screws.

General Information:

Quilting Screws are frequently referred to as Quilting "Pins", although they are made of threaded stock. They serve to hold the insulation and the sheathing in place.

They are purchased already threaded and ready for use, and are stored fo orders. The length is seven-eighths of an inch more than the thickness of the insulation to be served. Detail 1-G.

The end of the pin to be welded is not threaded and has been cut square for better welding and accurate length. The other end projects through the special nut (see Detail) and is clipped off and burred down to prevent the nut from backing off.

Specifications:

Quilting pins on 12" centers. In large area shift alternate rows so heads are 6" up and down from last line. See illustration Fig. 1. (Quilting pins must be within 18" of each other. In Sketches 1-M, 1-N, where areas are smaller, the layout is simply square).

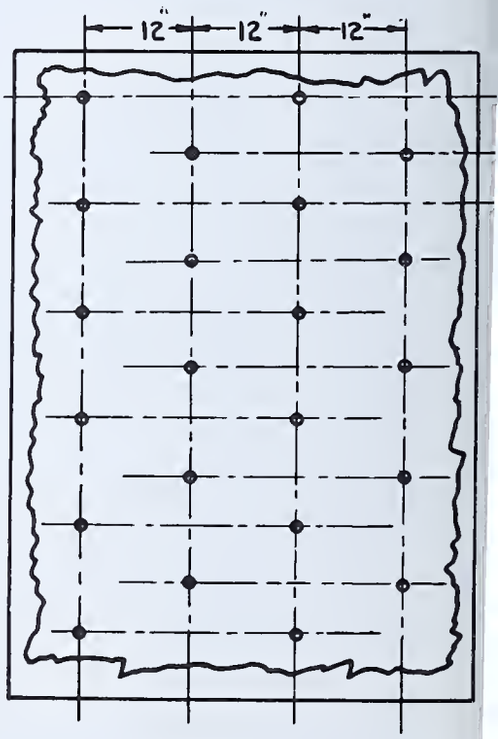


FIG. 1
QUILTING SCREW LAYO
FOR LARGE SURFACES

Tools needed:

Bolt cutters
Stock and die
Holding "tube"

Equipment needed:

Welding service

Materials:

Threaded stock #12, 28 NF 2 Steel
Length and number as required.

Procedure:

1. Secure stock of required length.

2. Re-thread end if necessary.

3. Mark off area for installation every 12".
(Alternate rows should be so spaced that the heads are 6" above and be those of preceding row. Fig. 1)

4. Adjust holding device for length of "pin". (This tube also serves to shed welding slag.)

5. Hold pin in place for welding.

Questions:

1. What threading is necessary in preparing Quilting Pins?

2. How much longer than the insulation must the pin be cut? Why?

3. What should be done to the pin after cutting it to length?

4. What are the reasons for this?

5. How far apart will the heads of the pins in alternate rows be? Explain.

6. Should one be concerned about the regularity of appearance of the layout for quilting screws? Why?

COMMERCIAL BAR-TYPE FITTINGS AND CLIPS

Objective:

To understand the standard commercial practice in installing insulation support fittings.

General Information:

The practice in other than naval installations is to weld a short supporting flat bar or channel bar, stock of length required; and then, after insulation has been placed, to weld in position the sheathing support bars of the same stock.

Channel bar is preferred because it is lighter in weight and its shape makes it more rigid.

The clips are flat hairpin-like straps which are welded in place with their ends projecting. The insulation is supported by a wire mesh (see picture), held in place by square plates under the spread clips.

OVERHEAD SHOWING CLIPS, MESH SUPPORT, AND SUPPORT BARS; EDGES OF ASBESTOS BOARD SHEATHING VISIBLE

Tools needed:

Rule
Chalk line
Tongs

Equipment:

Shears
Welding service

Materials:

1/4" x 1-1/4" channel bar stock, assorted lengths
1/8" x 1/2" x 10" hairpin clips bent double with a 1/2" top
Expanded metal wire mesh as required
1/8" x 2" x 2" M.W. plates with $\frac{1}{2}$" hole in center

Specifications:

Prepare overhead area for 2" insulation with 2" air space.
Clips 18" ℄.
Bars and bar supports 2' centers.
Adjacent bars to be welded to form one structure.

Procedure:

1. Lay out area for bars and clips with regard for alignment.

2. Shear or secure clips to length.

3. Hold in position for welder.

4. Notify insulation man of readiness of area.

5. Hold sheathing support bars in position and have welded.

Questions:

1. What is the purpose of the clip-straps?
2. What advantage do they have over the quilting screws?
3. Why are adjacent ends of the bars joined with a weld?
4. What is the purpose of the expanded metal lath or "mesh"?

INSTALL SUPPORT BARS FOR COLD STOWAGE SHEATHING

Objectives:

1. To learn the method of supporting cold stowage sheathing.
2. To learn how to install support bars for cold stowage sheathing.

General Information:

Since cold stowage rooms are more thickly insulated, the support fittings cannot be of the customary light angle support and quilting pin type. The supports are "framed" in from deck to deck as shown in sketch JJ. To prevent transmission of temperature a fiber ferrule and pad insulate the support clips from the bearer angles.

Tools needed:

Square
Straight edge
Level
Center punch
Scriber

Equipment needed:

Shears
Punch
C-Clamps
Welding Service

Materials needed:

As required by Bill of Material for specified jobs.

Procedure:

1. Secure data as to insulation thickness and type of fittings required.

2. Lay out position of corner support clips on deck and overhead.

3. Measure height, deck to overhead, at each corner.

4. Prepare corner angle uprights for these dimensions.

   See Detail GG1. (Top is same as at bottom.)

   (These angle uprights are usually fabricated slightly over-length for stock, and it is necessary only to shear clip at either end to secure proper length.)

a. Deduct projection of clip at top and bottom of angle from the typical height. See Fig. 1.

b. Shear angle slightly over-length and trim ends as shown.

c. Punch holes in angle for bolts.

d. Insert ferrule, washers, bolt.

e. Bolt clips to angle, carefully tightening nuts to avoid crushing insulators.

f. Shear clip, as required, to exact lengths needed.

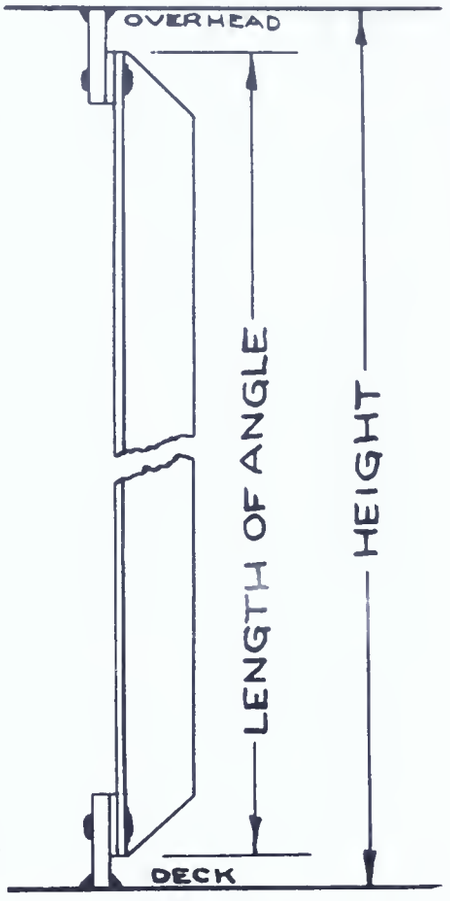


FIG. 1
LENGTH OF ANGLE

5. Place corner uprights and have clips welded to deck and overhead. Be sure angle is properly located and faces squarely to area.

6. Establish height of deck sheathing (under side) and mark on each angle upright.

7. Measure length of horizontal angle (Piece 10 GG2). Note the method of connecting angles with uprights. See No. 9 below.

8. Shear horizontal angles to length.

9. Trim ends of angle to fit upright support angles.

10. Clamp bottom horizontal angles to required elevation and have welded.

11. Repeat this operation for top horizontal.

12. Establish the elevation of junction angle where base and boundary sheathing lap.

13. Cut junction angle to fit.

14. Clamp and weld angle in position.

15. Repeat for top junction angle.

16. Cut and place short vertical angles as required by plan.

17. Cut and weld in place any necessary additional support-angle-on-clips beneath bottom horizontal bar. Maximum unsupported span is 4 ft.

Questions:

1. What is the purpose of the horizontal angle within 12 inches of the bottom bar as on sketch HH?

2. Why are corner angles made of heavier material than intermediate vertical angles?

3. Why is the bottom horizontal angle also of heavier stock?

4. When are added supports needed under bottom horizontal 2" x 2" angle? Why?

INSTALLING SUPPORT BARS FOR DECK SHEATHING

Objective:

1. To learn the method of installing support bars for deck sheathing.

General Information:

Where the deck surface must be insulated, as in refrigerator rooms and ammunition stowages, the problem of load support must be considered. All racks and bins are directly supported to the deck itself, and sheathing supports are placed where required by other loading conditions.

Sometimes a short length of support bar is placed in the center of a section to prevent sag.

The various types of deck sheathing supports are shown in Details AA to FF. Today most supports are welded rather than bolted to the deck clips.

Tools needed:

Straight edge
Declivity Board
Square
Level
Chalk line

Equipment needed:

Shears
Punch
C-Clamps
Welding Service

Material needed:

As required by Bill of Material for job.

Procedure:

1. Establish marks for finish line of deck sheathing. Lay-out man must carefully provide for necessary clearances in reference to stowage racks.

2. Check line of deck sheathing with boundary faces, to establish 90° relationship at ends. Highly important in ammunition stowage.

3. Lay out area for support clips and bars.

4. Secure material and cut to length, and prepare special applications as necessary.

5. Tack-weld clips in place.

6. Clamp a bearer in position at one end of the area.

7. Check height and tack-weld.

8. Install another bearer or angle at other end of the area, check, and tack-weld.

9. Stretch chalk-line from bearer to bearer, at each end.

10. Place one or two intervening bearers on specified spots, raise to chalk line, clamp, and tack-weld. (These should be within six feet of each other to permit use of straight edge in setting the others.)

11. Clamp straight edge across tops of bars which are in position. This establishes height of intervening bars. See sketch Fig. 1.

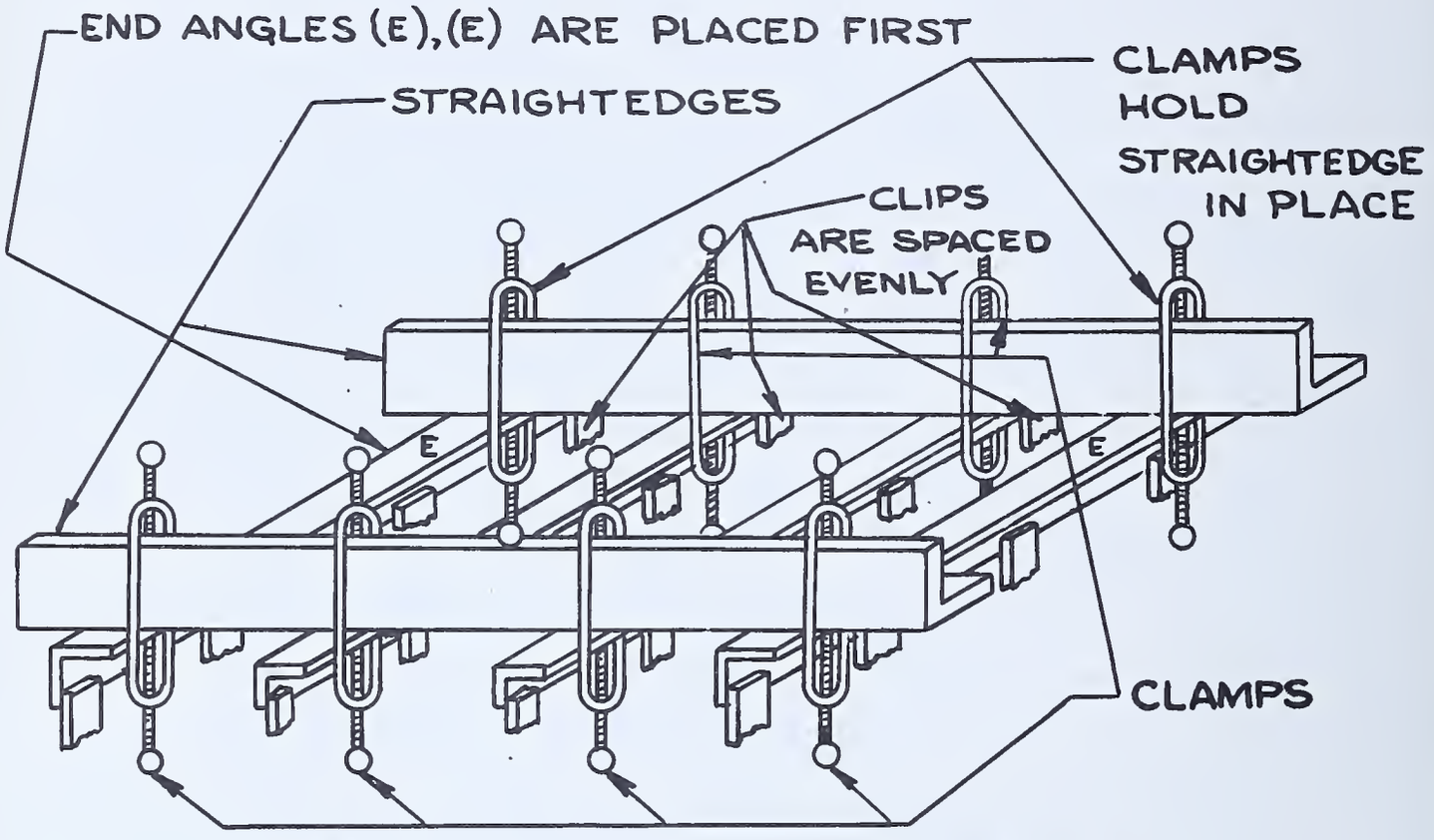


FIG 1. — METHOD OF USING STRAIGHTEDGE TO SET ANGLE BARS

12. Clamp intervening angles or bearers to the straight edge and tack weld to clips.

13. Check surfaces and adjust where necessary.

14. Weld all members securely.

15. Smooth top surfaces.

Questions:

1. Why are supports only tack-welded at first?
2. Why is it important that the deck and boundary sheathing be at 90° to each other?
3. What are the advantages of using a straight edge to install bearers and angles?
4. What bars should be installed first in an area?
5. Why is it necessary to use a chalk line at all?

LIFTING SHEATHING FROM SHIP

Objective:

To learn how to measure and make templates for sheathing.

General Information:

All sheathing supports (angles, coaming, clips and quilting pins) are welded to structure before sheathing is measured or templated. Edges of sheathing are not allowed to butt tightly either at joints or boundaries; this provides a free-way in fitting, and the moulding conceals all openings. Sometimes sheathing provides its own finish at coamings and seam laps (Details 1C, 1J and 1K), and very careful fitting is necessary.

Specifications:

See Bill of Material for gauge of sheathing.

Tools needed:

Rule
Hammer
Marking crayon
Straight shears
Aviation shears

Equipment needed:

Cardboard for templating

Procedure:

A. If place to be sheathed has square corners and no cut-outs, measure with rule for sheathing and make pencil sketch of sheathing size.

B. If irregular in shape or complicated by obstructions, a cardboard template is required.

1. Lay out shape of panel required on cardboard template paper and cut to suit.
(Sheathing should lap over at angle supports about 1/4". See Detail 1- A)

2. Place washer piece on each quilting pin to the required thickness for insulation.

3. Place cardboard in position so that edges go about 1/4" onto the angle.

4. Force quilting pins through cardboard, keeping cardboard as flat as possible.

5. Mark template with crayon for identification as to location.

6. Mark with crayon on area so templated, the words "Sheathing Lifted" to prevent duplication.

Questions:

1. Why is it necessary to template the area to be sheathed?

2. Why is reference made to Bill of Material for gauge of metal?

3. Why is washer used on quilting pin?

4. After lifting template, what else should be done before sending to shop for fabrication?

FABRICATION OF SHEATHING

Objective:

To learn how to fabricate sheathing from measurements and templates.

General Information:

Edges of sheathing are frequently beaded where the sheet laps coaming at boundary, and at seam or joint laps. The purpose of the beading is to reinforce the edge of the sheet and provide more rigid closure of area. See Details 1C, 1J, and 1K.

Sheets, after being primed, are painted with two coats of specified paint on one side, and one coat on the other side before fabrication.

Care is to be taken that the sheets are made so that the side painted with two coats faces in toward the insulation or structure rather than toward the area space.

Specifications:

1/32" aluminum or 26 gauge (.01875) M.W. galvanized steel; .032 copper nickel alloy perforated (for soundproofing).

Tools needed:

Rule
Hammer
Center Punch
Hollow Punch 5/16"
Mallet
Straight Shears
Aviation Shears
Half round Fine File
Prick Punch

Equipment needed:

Beading Machine
Squaring Shears

Procedure:

A. If sheathing is to be measured

1. Mark off necessary size on sheathing and cut.
2. Put in position and tap with a mallet over each quilting pin to locate its position.
3. Proceed as below (steps 5-10).

B. If sheathing is to be marked from template

1. Place template on sheathing and hold down with weights.
2. Mark outside of template with pencil.
3. Center punch at mid-point of each quilting pin hole.
4. Remove template and shear to line.
5. Place center marks for quilting pins over a lead block.
6. Punch on center with 5/16" hollow punch.
7. Turn sheet over and with mallet dress up burred edges against steel block.
8. File burred edges.
9. Bead edges as required; note on detail 1-J provision for bead at seam laps.
10. Paint and stack to dry.
11. When the paint is dry, place identification marks on insulation side of sheet.

Questions:

1. Why are the sheets made up with the double coat of paint on the structure side?

2. Why do they bead the edges of sheets?

3. Why are quilting pins used?

4. How are holes for quilting pins made in sheathing?

5. Why is deburring and dressing with mallet necessary?

INSTALLATION OF SHEATHING

Objectives:

To learn how to install sheathing.

General Information:

Before sheathing is done, the space must be cleaned, painted by ship's painter, and insulation material installed.

Tools needed:

Hammer
Center Punch
Dividers
Mallet
Screw driver
Drills for #10 self-tapping screws
Straight edge
Chalk line
Quilting nut wrench

Equipment needed:

Electric Drilling Machine
Beading Machine

Materials Needed:

Non-corrosive sealing compound
Washers (Piece #19)
Special nut (Piece #14)
#10 round head self-tapping screws (Piece #6)

Procedure:

1. Adjust washer on quilting pin to be on plane with face of angle support, using straight edge or chalk line.

2. See that insulation material is in place (forced over washer and a string tied from one support to another to hold temporarily in position) and that no void spaces exist.

3. Place paste compound over washer and angle support.

4. Place sheathing.

5. Place special nut on quilting pin and tighten.

6. Check sheathing for plane surface and absence of "buckles".

7. Clip off quilting pin even with bolt head.

8. Burr end of pin into slot of quilting pin nut.

Note:

This should be done only after possible removal of sheet is past; it is usually done weeks after installation.

Questions:

1. How is a straight line secured for quilting bolt washers?

2. Why is a straight line necessary for them?

3. Why is non-corrosive sealing compound used?

4. Why are quilting pin ends burred? When is this done?

5. Why are quilting pins not burred at time of installation of sheathing?

REMOVAL OF SHEATHING

Objective:

To learn how to remove sheathing.

General Information:

It is frequently necessary to remove sheathing for access to insulated areas due to structural changes and possible oversights in original layouts.

This removal requires extreme care to avoid buckling or otherwise damaging the sheet. Care must also be exercised to prevent disturbing insulation material more than necessary. The various members and fasteners should be carefully kept for reinstallation.

Tools needed:

Quilting nut wrench
Hooked point awl
Small, flat, chisel-point bar 3/8" x 1" x 24"

Procedure:

1. Remove moulding if necessary.

2. Remove quilting screw nuts.

3. Gently enter the pry bar behind sheet at one edge.

4. Place point of pry bar to land on surface of washer closest to sheathing edge.

5. Ease sheet out gradually, prying from various washers along edge; and then from more central washers until sheet is practically clear.

6. Pry center of sheathing out to enable entry of hooked awl in one of center holes. This helps to support and control the loosened sheet.

7. Place sheet in safe location.

8. Replace quilting screw nuts. This will protect threads and provide storage for the nuts.

Questions:

1. Why is a pry bar necessary?
2. What is the purpose of the hooked awl?
3. What provides backing for the pry bar?
4. Why are edges pried loose first?
5. What care should be given the removed sheet?
6. What should be done with quilting screw nuts? Why?

REINSTALLATION OF SHEATHING

Objective:

To learn how to reinstall sheathing.

General Information:

Sheathing is reinstalled only after necessary structural changes have been cleared by Inspector. Insulation material, if not in original condition, must be replaced to the satisfaction of proper inspector.

Tools Needed:

Special Quilting Nut Wrench
Rule
Screw driver
Mallet

Materials:

Sheathing as per Bill of Material.

Procedure:

1. Trim and refit to new obstructions as may be necessary.
2. Apply non-corrosive compound on edges of sheathing as required.
3. Check position of washers.
4. Return sheathing to its original position.
5. Hold sheathing in place and secure with occasional quilting nuts.
6. Place and tighten remaining nuts on quilting screws.
7. Check sheathing to see that there is no buckling.
8. Replace moulding and secure with screws.

Questions:

1. What is the first step in reinstalling sheathing?
2. What consideration is involved regarding insulation filler material?

DECK SHEATHING

Objective:

To learn how to lift, fabricate, and install deck sheathing.

General Information:

Deck sheathing is installed wherever it has been necessary to insulate the structural deck. In ammunition stowages it is screw fastened; elsewhere it is usually plug welded in place.

In general, the joint support angle bars are laid out in consideration of the width of stock sheathing plates. Load bearers are placed entirely in consideration of the load, and sheathing support to them is incidental.

Specifications:

Adjacent edges of sheathing must be straight, undamaged, tightly fitted, and secured without ripples, kinks, bumps, or open joints. (Tolerance joints 1/16".)

Tools needed:

Rule
Drill
Countersink
Screw Driver
File

Equipment needed:

Lever Shears
Throatless Shears or
Nibbling Machine
Electric Drill

Procedure:

1. Secure inspection release of support fittings and insulation of area.

2. Check location of "joint" bars.

3. Lift dimensions and shapes of sheets required. Template irregular shapes where necessary to provide for obstructions. Sometimes protruding bolts necessitate routing out underside of sheet.

4. Fabricate on drop shear; for irregular shapes use the nibbler or unishear.

5. Lay out holes.

6. Drill, or drill and countersink, as required.

7. Clean surface of support bars.

8. Lay deck sheathing.

9. Check alignment of joints and adjust to fit as specified.

10. Drill through the holes in sheathing plate into the angle support.

11. Secure plate in position with a few screws. (Have plug welded if specified.)

12. Complete installation of screws and repeat operations for other plates.

Questions:

1. Where is deck sheathing necessary?

2. What methods of fastening this sheathing are employed?

3. How will the plate be made to fit over the bolt heads or other sub-surface projection?

4. What is the maximum tolerance in deck sheathing joints?

PART II — INSULATION

INTRODUCTION

Hull, ducts, pipes, quarters, and storage spaces must be insulated against temperature changes for cargo protection, safety, or convenience. Insulation may be merely to prevent condensation on the interior of quarters, it may be to prevent spoiling of food in refrigerated spaces, or it may be to prevent temperature changes which lower the effectiveness of stored ammunition. It may serve to deaden the noise of a galley or to soundproof the radio room. From hull to bridge, insulation is specifically applied according to the respective requirements.

Practice varies among shipyards as to just who installs insulation. Insulation specialists, joiners, and sheet metal workers are concerned, depending upon local custom or upon the type of material used. Sometimes outside sub-contractors are utilized, and in other cases the job is done by the yard personnel. In any event, the metal worker erects necessary metal supports and installs metallic sheathing.

In some installations, joiners bolt or screw wood or composition studding and framework to metal bar clips which have been welded in place, and go on to complete the whole process independent of other ship workers. Various non-metallic sheathings are replacing the metallic types, and an interesting technological competition is in progress among manufacturers of cork, asbestos, and glass insulation and sheathing materials.

The purpose of this unit is to present general information pertaining to several types of insulation without attempting in any way to evaluate them.

TYPES OF INSULATION

ASBESTOS

A. Ammosite (Loose Asbestos Fiber)
B. Asbestos Cement
C. Cellular Asbestos
D. Compressed Asbestos Board
E. Slab Asbestos

CORK

F. Compressed Cork
G. Granulated Cork

FELT

H. Hair (Curly) Felt

GLASS

J. Foam Glass
K. Fiber Glass Boards
L. Fibrous Glass

MAGNESIA

M. 85% Magnesia Blocks and Pipe Forms

MINERAL AND ROCK WOOL

N. Granulated Rock Wool
O. Mineral Wool
P. Mineral Wool Board
Q. Rock Wool

(A) AMMOSITE
(Loose Asbestos Fiber)

1.	Appearance	Grayish white fibers.
2.	Purpose	Medium High Temperature Insulation (300-600° F.) where bulk space is available.
3.	Where Used	In Boiler Casings, Fuel Oil Heaters, and Turbine Cases.
4.	How Received	In close knit burlap bags, asbestos cloth, or cotton bags for portability; as loose bulk; in moulded form for pipe covering.
5.	Peculiarities or Special Precautions	It blows about easily, handle as you would feathers.
6.	Accompanying Materials	Asbestos Cloth, Metal Casing, Asbestos Cord, Metal Screws, etc.
7.	Necessary Equipment or Special Tools	Goggles, Respirator Mask, Screw Driver, Tin Shears, Pliers, Packing Ram Rod 3/4" diam. and about 3'-0" long.
8.	How Fastened or Secured	Packed into enclosed area.
9.	Degree of Skill Required	Special trade. Skilled mechanics.
10.	Finish Required for Protection	Enclosed in special areas.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Procure material as specified. 3. Procure necessary equipment and tools. 4. Fill in area to the specified density (number of pounds per cubic foot). 5. Seal up area as specified.

(B) ASBESTOS CEMENT

1.	Appearance	Grayish white, tending to be slightly fibrous and of the texture of a soft cement or powder.
2.	Purpose	Medium High Temperature Insulation (300-600° F.) For use as a hard surface finish material over granulated asbestos plastic mixture or slab asbestos.
3.	Where Used	Where a hard surface plaster finish is desirable.
4.	How Received	In cotton bags, or special paper bags and cartons, or in loose bulk.
5.	Peculiarities or Special Precautions	Handle in shelter from wind. Protect eyes and nose. Do not tamp or pack asbestos mixture lest the cellular insulative value be destroyed.
6.	Accompanying Materials	Water, Silicate of Soda, Granulated Asbestos.
7.	Necessary Equipment or Special Tools	Mixing Trough, Mixing Rake, Trowels, Plaster Hawk.
8.	How Fastened or Secured	Plastered on, allowed to dry, and finished off to a smooth troweled finish.
9.	Degree of Skill Required	Special trade. Skilled mechanic.
10.	Finish Required for Protection	Plaster finish.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Procure material as specified. 3. Procure necessary equipment and tools. 4. Mix into a plastic mass and apply lightly to area to be insulated. Do not tamp or pack. 5. Plaster over the area to specified thickness and smooth to a finish as it dries out.

(C) CELLULAR ASBESTOS

1.	Appearance	Grayish white fluted structure which resembles rolled corrugated cardboard in cellular composition.
2.	Purpose	Medium High Temperature Insulation up to 300° F.
3.	Where Used	In Low Pressure Boiler Drums, Steam Lines, Engines, etc.
4.	How Received	In sheets or slabs and moulded forms to various thicknesses as required.
5.	Peculiarities or Special Precautions	Average care.
6.	Accompanying Materials	Copper Wire, Staples, Thin Metal Strips, Asbestos and Canvas Cloth, Wire-core Asbestos Cord.
7.	Necessary Equipment or Special Tools	Rule, Hook-Blade Knife, Pliers, Saw, Apron, Tin Shears.
8.	How Fastened or Secured	Bound with copper wire, wire-core asbestos cord, and metal strip, finished off with plastic mixture, usually asbestos cement.
9.	Degree of Skill Required	Special trade. Skilled mechanic.
10.	Finish Required for Protection	Asbestos cloth or canvas cloth sewed on and painted.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Procure material as specified. 3. Procure necessary equipment and tools. 4. Fit sheets or slabs to areas and bind with wire and staples. 5. Apply finish covering as specified and secure neatly.

D) COMPRESSED ASBESTOS BOARD

1.	Appearance	Board-like, smooth textured, grayish to white, slightly glazed surface on finish side. Rough side is slightly textured. Sometimes supplied with metal on both surfaces, a sheathing of 27 gauge galvanized steel to provide added protection of area surface.
2.	Purpose	Used as sheathing over some other form of insulation. No claim made by manufacturer for added insulation provided. Greatest value is in fireproofing.
3.	Where Used	In quarters and other non-extreme temperature areas.
4.	How Received	4' x 8' sheets of various thicknesses, usually 3/8" to 1".
5.	Peculiarities or Special Precautions	Brittle. Should be handled with reasonable care for edges.
6.	Accompanying Materials	Self-tapping flathead screws and ornamental moulding strips.
7.	Necessary Equipment or Special Tools	Saw, File, Drill, Countersink, Screw Driver, Support Sticks, and Clamps to hold while erecting.
8.	How Fastened or Secured	Holes drilled and countersunk through board into flat bar and self-tapping screws inserte
9.	Degree of Skill Required	Skilled or semi-skilled workers. Sometimes joiners, sometimes insulation workers.
10.	Finish Required for Protection	Painted if specified and moulding placed on joints.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Cut boards to size and shape; bars have been laid out with consideration for joi 3. Place board in position and secure with clamps or wooden braces against structur 4. Drill holes through board into support bars. 5. Countersink holes in board. 6. Screw fasten board in place and remove clamps and braces. 7. Repeat for remaining surface. 8. Install necessary moulding.

(E) SLAB ASBESTOS

1.	Appearance	Plaster-like, white, fibrous blocks.
2.	Purpose	High Temperature Insulation, 600° F. and up.
3.	Where Used	High Pressure Boiler Drums, Steam Lines, Turbines, etc.
4.	How Received	As slabs or blocks in cartons, various thicknesses as required 1" to 6", or moulded in 1/2 diams., etc.
5.	Peculiarities or Special Precautions	Nothing special except average care. If bumped or dropped it tends to break and crumble.
6.	Accompanying Materials	#16 Copper Wire, Wire Core Asbestos Cloth and Cord, Thin Metal Binding Strips, and Copper Wire Staples.
7.	Necessary Equipment or Special Tools	Rule, Saw, Pliers, Apron and Tin Shears.
8.	How Fastened or Secured	Bound with #16 copper wire; ends joined with staples. Wire-core asbestos cloth stitched on with wire-core asbestos thread.
9.	Degree of Skill Required	Special trade. Skilled mechanic.
10.	Finish Required for Protection	Asbestos cloth sewed on canvas is sometimes used.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Procure specified material and necessary equipment and tools. 3. Fit slabs or moulded sections in position in area and bind with specified binder. (High pressure lines require bands to prevent cutting asbestos; auxiliary steam can use wire). 4. Apply finish covering as specified and secure neatly.

(F) COMPRESSED CORK

1.	Appearance	Brownish, compacted chips of cork which adhere to each other because of natural oil released in compressing. This oil loses its adhesion above 150°; therefore, cork is used only as a low temperature insulant.
2.	Purpose	Sound absorption and low temperature insulation (40° to 150° F.)
3.	Where Used	Areas requiring soundproofing, living spaces, cold storage spaces, heated and cold air ducts, trunks, chemical storage tanks, etc.
4.	How Received	As sheets and blocks in cartons to various thicknesses as required; also in moulded, "split cylinder" sections, for 1/2 diam. for lines and fittings.
5.	Peculiarities or Special Precautions	Average care to avoid crumbling chips from block.
6.	Accompanying Materials	Asphaltic Paints, Hard Asphalt, or Special Binder Cement in liquid form, or thick paste paint. Binder wire (#16 soft galvanized), galvanized nails, wooden skewers.
7.	Necessary Equipment or Special Tools	Saw, Rule, Rasp, Paste Trowel, Hammer, Pliers, Wood Chisel, and Cement Spreader.
8.	How Fastened or Secured	Binder Cement dries out, holding slab in place firmly. Nails secure to wood under-structure, and skewers help hold additional layers after the first is placed.
9.	Degree of Skill Required	Usually done by second-class joiners.
10.	Finish Required for Protection	Thick binder cement on surface faults, canvas or muslin covering, and painted. Sometimes surfaced with metal, usually MW galvanized steel, 26 gauge (.03175).

11. Method of Application "Procedure"

1. Ascertain inspection release of area.
2. Procure material as specified.
3. Procure necessary equipment and tools.
4. Cut slabs to shapes required.
5. Spread cement evenly over area; butter seams and joints well.
6. Press into position the respective slabs, bind with binder wire as specified, and leave to dry out.
7. Spread seam filler on exposed surface to fill in cracks and voids; protect until dry.
8. Wrap with resin-sized paper.
9. Cover with muslin or canvas and stitch in place, or:
10. Sheath with metal if specified.

(G) GRANULATED CORK

1.	Appearance	Chips of cork.
2.	Purpose	Latent heat absorbant; low temperature insulant; to prevent condensation, usually in conjunction with asphalt.
3.	Where Used	On water pipes, bulkheads, and water decks; also on structural shapes, hull sides, tanks, reservoirs, cold air ducts, refrigerator lines, etc.
4.	How Received	In burlap bags; compressed paper drums; cartons, etc. Loose bulk.
5.	Peculiarities or Special Precautions	Must be handled in shelter from wind; protect eyes and nose. Enclosure of granulated cork must be vapor sealed.
6.	Accompanying Materials	Special Binder Cement in liquid form as a thin paste paint. Asphalt paint and paper on all adjacent structures.
7.	Necessary Equipment or Special Tools	Special Cork Blower, Paint Brush, Buckets, Scrapers, and Paint Sprayer.
8.	How Fastened or Secured	Binder Cement dries out and holds grains in place.
9.	Degree of Skill Required	Usually done by painter-crew and helpers.
10.	Finish Required for Protection	Developed in the natural drying out process of the paint. Is poorest self-protected of all insulants.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Procure material as specified. 3. Procure necessary equipment and tools. 4. Paint the area with Binder Cement, and before it dries: 5. Spray cork on evenly with blower to the density as specified (number of grains to the square inch). 6. Provide protection for area until cement has dried. 7. Spray paint as required for finish.

(H) HAIR (CURLY) FELT

1.	Appearance	Brown, matted, hair-like felt.
2.	Purpose	General heat absorbant used as low temperature insulant.
3.	Where Used	On Vent Pipes and Ducts; in conjunction with Cellular Asbestos on low temperature steam and hot and cold water lines.
4.	How Received	Quilted in between sheets of tough paper, in felted rolls, and stitched to burlap backing.
5.	Peculiarities or Special Precautions	Observe reasonable care with fibers to prevent skin irritation.
6.	Accompanying Materials	Canvas covering similar to that used on slab and cellular asbestos.
7.	Necessary Equipment or Special Tools	Rule, Hook-Blade Knife, Pliers, Apron, and Tin Shears.
8.	How Fastened or secured.	Bound with copper wire or metal strip, or tied with cotton twine.
9.	Degree of Skill Required	Skilled trade. General insulation worker.
10.	Finish Required for Protection	Plastic mixture covered with asbestos cloth or 4 to 6 oz. canvas cloth sewed on and painted. Sometimes spirally wrapped with fiber glass tape.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Determine thickness of insulation required. 3. Secure proper materials. 4. Secure proper tools and equipment. 5. Cut from rolls of hair felt sufficient lengths required to surround item to be insulated. 6. Wrap in spiral fashion tightly and evenly, securing with binder wire tight enough to hold firmly in proper position. 7. Cut required width and length of canvas and sew on tightly with seam on far side if possible. 8. When hair felt is used in conjunction with cellular asbestos, repeat steps 1 to 6 inclusive after first applying asbestos.

(J) FOAM GLASS

1.	Appearance	Minutely cellular glass block with texture of fine rubber sponge. Great compression strength of 150 lbs. per sq. in. and weight of only $7\frac{1}{2}$ lbs. for a block 12" x 18" x 6". Waterproof and fumeproof.
2.	Purpose	Cold Storage Insulant.
3.	Where Used	Refrigerator Spaces and Cold Storage subject to much dampness or humidity. Areas to be washed frequently.
4.	How Received	Blocks 2" to 6" thick. Standard 12" x 18" size.
5.	Peculiarities or Special Precautions	Vaporproof and waterproof; in fitting is used as self-abrasive by rubbing together. It can be sawed more easily than wood.
6.	Accompanying Materials	Asphalt Cement; Angle Iron Support Bars for overhead.
7.	Necessary Equipment or Special Tools	Saw, Mitre-box, Brush or Trowel to apply hot asphalt, and Gloves.
8.	How Fastened or Secured	Hot asphalt joints, laid on edge similar to masonry. For overheads, laid between flanges of "⊥" angle bars.
9.	Degree of Skill Required	Semi-skilled or skilled workmen.
10.	Finish Required for Protection	May be left natural, but frequently cement plaster finish is applied.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area, clean, etc. 2. Coat with asphalt paint the surfaces to be insulated. 3. Place "bed" layer of asphalt in place. 4. Fit as required and lay blocks, buttering well between joints with asphalt cement. Lay second layer so that joints are not together. 5. Coat surfaces with specified finish after they have dried.

(K) FIBER GLASS BOARDS

1.	Appearance	Brownish-white, silk-textured, matted fibers of glass, faced with woven glass fabric as part of the product.
2.	Purpose	Sound absorption, cold stowage, and high temperature (range to 600° F.). Acts to insulate and sheath.
3.	Where used	Living Spaces, Vent Ducts, Cold Stowage, Soundproof Areas, and Water Pipes.
4.	How Received	Slabs to various thicknesses; standard sheets 2' x 8' and $3\frac{1}{2}$' x 6'.
5.	Peculiarities or Special Precautions	Semi-rigid; only slightly flexible. Handle with average care.
6.	Accompanying Materials	Special Cohesive Non-toxic Cements, Woven Glass Fiber Tape, Quilting Screws, Nuts, and Washers.
7.	Necessary Equipment or Special Tools	Knife, linoleum or saw tooth (similar to bread knife), Putty Knife, Rule, Cement Brush or Comb, and Cotton Cord.
8.	How Fastened or Secured	Cohesive Cement and Quilting Screws.
9.	Degree of Skill Required	Skilled or semi-skilled workers; sometimes installed by joiners.
10.	Finish Required for Protection	Regular painting on own fabric surface sufficient, unless metallic sheathing is specified.
11.	Method of Application "Procedure"	1. Determine type of insulation required. 2. Install quilting pins to spacing required. 3. Ascertain inspection release of area. 4. Procure material as specified. 5. Procure necessary tools and equipment. 6. Remove slabs from cartons. 7. Cut to size and shapes required. 8. Apply cohesive cement (liquid). 9. Press gently into position the respective sections of fiber glass boards. 10. Install washers and nuts on quilting pins. 11. Cut sufficient lengths from rolls of fiber glass tape, and cement around edges and on joints. 12. Smooth out tape, dividing width of tape evenly on both sides. 13. Cut quilting pins flush with nuts and burr ends. 14. Release areas to painters.

(L) FIBROUS GLASS

1.	Appearance	Matted fibers of glass; silky, brownish white bulk.
2.	Purpose	Sound Absorption and Low and High Temperature Insulation up to about 1000° F.
3.	Where Used	Hull and Deck Insulation, Living Spaces, Vent Ducts, Cold Storage Spaces, Soundproof Areas, Boiler Uptakes, Machinery Spaces, and Fans.
4.	How Received	(a) Rolls or blankets quilted with a flameproof fabric cord onto a flameproof muslin or burlap backing (250° F.). (b) Slab or bat about 2' x 8' in loosely compacted mass, received packed by layers in cartons. Must be handled with care to prevent separating. (c) Loose bulk.
5.	Peculiarities or Special Precautions	Very fine texture. It must be handled with reasonable care to prevent possible irritation of eyes, nose, and tender skin. All fibrous products of any material can irritate if reasonable care is not observed.
6.	Accompanying Materials	Standard Support Fittings; Flameproof Cotton Cord to hold in place before sheathing.
7.	Necessary Equipment or Special Tools	Loose clothing that does not chafe or bind to rub fibers against skin.
8.	How Fastened or Secured	Placed in position over area and corded securely.
9.	Degree of Skill Required	General tool skill.
10.	Finish Required for Protection.	Metallic Sheathing or Composition Material.
11.	Method of Application "Procedure"	1. Determine type and thickness of insulation required. 2. Ascertain inspection release of area. 3. Procure material as specified. 4. Procure equipment. 5. Remove layers from carton and place in space to be insulated, keeping an approximate equal thickness throughout. Endeavor to keep layer paper on glass until bat is in position to be corded.

(M) 85% MAGNESIA BLOCKS AND PIPE FORMS

1.	Appearance	White, plaster-like, fibrous material reasonably stable, but rather brittle and crumbly.
2.	Purpose	Heat Insulation up to 600° F.
3.	Where Used	Pipe coverings and surface insulation, up to 600° F.
4.	How Received	In cartons.
5.	Peculiarities or Special Precautions	Requires average care to keep from breaking under hard impacts.
6.	Accompanying Materials	Galvanized wire or clips. Magnesia cement.
7.	Necessary Equipment or Special Tools	Pliers, Saw, and Trowel.
8.	How Fastened or Secured	Wired in place, or slabs held to the surface by spread clips.
9.	Degree of Skill required	Skilled mechanics.
10.	Finish Required for Protection	Plaster or cement finish coat. Canvas pipe covering.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Procure necessary material and tools. 3. Pierce for clips. 4. Fit slabs as required. 5. Place slab. 6. Spread clips to hold slab. 7. If moulded forms are used, place split sections and secure with wire. 8. Apply finish specified.

(N) GRANULATED ROCK WOOL

1.	Appearance	Small, grayish white, fibrous pellets.
2.	Purpose	Moderate to high Temperature Insulation up to about 1000° F.
3.	Where Used	As a filler or for a Plastic Mass for application required by an irregular shape.
4.	How Received	Loose bulk in burlap bags, cartons, etc.
5.	Peculiarities or Special Precautions	Must be handled in shelter from wind. Protect eyes and nose. Do not "pack", unduly tamp, or compress mixture in applying; this destroys insulative cellular structure.
6.	Accompanying Materials	Water, Silicate of Soda, Asbestos Cement, and Wire Mesh.
7.	Necessary Equipment or Special Tools	Mixing Trough, Mixing Rake, Trowels, etc.
8.	How Fastened or Secured	Poured in molds or plastered on, allowed to dry, and finished off with asbestos cement mix.
9.	Degree of Skill Required	Special trade. Usually sub-contracted by outside firm. Skilled mechanics required.
10.	Finish Required for Protection	Asbestos Cement with muslin or canvas covering.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Procure material as specified. 3. Procure necessary equipment and tools. 4. Mix into a plastic mass and apply evenly to specified thickness to area to be insulated. Do not "pack" mass; trowel lightly. 5. Embed wire mesh in wet mass. 6. Allow to dry partially (several hours). 7. Apply finish specified.

(O) MINERAL WOOL

1.	Appearance	Matted fibers resembling wool felt.
2.	Purpose	Low temperature and heat insulation up to about 250° F.
3.	Where Used	Cold Storage Spaces, Vent Ducts, and Living and Working Spaces. Also in Soundproof Areas as a backing in conjunction with sound absorption material.
4.	How Received	Loose bulk, felted pads in cartons, quilted to burlap backing strip as felted pads, and loose in cartons.
5.	Peculiarities or Special Precautions	Fine texture, handled with average care. Protect eyes, nose, and tender skin with reasonable precautions.
6.	Accompanying Materials	Cord to hold in position before sheathing.
7.	Necessary Equipment or Special Tools	Knife.
8.	How Fastened or Secured	Placed in position over area and corded securely to angles and quilting screws. May be held in place with expanded wire mesh clipped in place.
9.	Degree of Skill Required	Very little.
10.	Finish Required for Protection	Metal sheathing, plain on temperature insulation, perforated on soundproof areas. Various board types of sheathing.
11.	Method of Application "Procedure"	1. Determine type of insulation required. 2. Ascertain inspection release of area. 3. Procure material as specified. 4. Procure equipment. 5. Remove layers from packing case and place in space to be insulated, keeping an approximate thickness throughout. 6. Install cotton cord to hold in place temporarily. 7. Place protection sheathing, and secure with quilting nuts and #10 self-tapping screws.

GENERAL NOTES:

1. Mineral wool is graded as to density or number of pounds per cubic foot.

2. Specifications for insulated areas indicate density required, e.g., "2# Den". This indicates that Mineral Wool 2 pounds per cubic foot is to be used.

3. Mineral wool used on soundproof and thermal insulation must not be packed into given area greater than its natural density; the density is spun into the product at source of manufacture. Excessive packing breaks the minute fibers, and impairs the structure.

4. Protect eyes, nose, throat, and skin in all contacts.

(P) MINERAL WOOL BOARD

1.	Appearance	A fibrous board consisting of mineral wool with a waterproof binding agent, processed to form a strong homogenous sheet.
2.	Purpose	Low temperature, minus 20° to plus 150° F.
3.	Where Used	Cold Storage and rooms requiring moderate, fixed temperatures.
4.	How Received	Cartons. Thickness varies 1" to 4". Board is 12" x 36".
5.	Peculiarities or Special Precautions	None other than reasonable protection of material.
6.	Accompanying Materials	Asphalt Priming Paint and Hot Asphalt for joints, Galvanized Nails, Treated Hardwood Skewers.
7.	Necessary Equipment or Special Tools	Saw, Hammer, Mallet, Brush, and Trowel.
8.	How Fastened or Secured	First layer nailed to wooden frame work; successive layers secured by treated hardwood skewers.
9.	Degree of Skill Required	Skilled insulation worker or joiner.
10.	Finish Required for Protection	Asphalt Plastic finish by itself, or painted over with any lead and oil paint. (Shellac before applying paint over asphalt.) Also finished with Portland Cement Plaster.
11.	Method of Application "Procedure"	1. Clean surface. 2. Erect necessary wood studs or install necessary clips on quilting pins. 3. Apply asbestos primer. 4. Fit and erect blocks, using asphalt in all joints. 5. Nail to studs or spread clips to fasten. 6. Apply asphalt to surface. 7. Fit and erect second layer, staggering all joints so that they do not occur in front of joints of first layer. Use mallet to drive wooden skewers. 8. Apply finish coats.

(Q) ROCK WOOL

1.	Appearance	Loose fibrous mat; specially treated, homogenous mineral rock.
2.	Purpose	General temperature absorbent.
3.	Where used	Laid against hull.
4.	How Received	In cartons 3' x 5' mats, thickness as ordered.
5.	Peculiarities or Special Precautions	Average handling care to avoid undue separation of fibers.
6.	Accompanying Materials	Special Adhesive Cement, Wire Clips, and Washers. Expanded Metal Lath if cement finish is to be applied.
7.	Necessary Equipment or Special Tools	Trowel or cement applying brush or comb. Pliers and Hammer.
8.	How Fastened or Secured	Attached to hull with special binder cement, wire clips are bent over washers to help hold in position.
9.	Degree of Skill Required	Semi-skilled or skilled trade.
10.	Finish Required for Protection	Metal sheathing or other covering, or cement coating over expanded metal lath.
11.	Method of Application "Procedure"	1. Ascertain inspection release of area. 2. Apply binder cement to surface to be insulated. 3. Apply rock wool blanket. 4. Place washer and bend wire clips to hold. (Where cement finish is required, expanded metal lath is placed and clips are bent to hold.) 5. Finish with specified sheathing or cement.

PART III — MOULDINGS

INTRODUCTION

Various mouldings are installed to provide closure and finish to the area which has been sheathed. Where ordinary seam laps occur on sheathing, a simple beading is formed on the face of the outer sheet. At coamings and exterior corners, a bead on the sheathing likewise provides necessary trim.

In most cases the moulding is made of the same material as the sheathing. Special dies are fabricated and kept in stock; simple forming operations on the drop brake then give the shape desired.

Stock mouldings may be purchased and are widely used in commercial work.

The following procedures for lifting, fabricating, and installing mouldings are applicable to the various types.

LIFTING MOULDING

Objective:

To learn how to lift moulding from ship structure.

General Information:

After the sheathing is installed, the section is ready for moulding, or closing strip, around the sides and ends of panel.

Information as to type of moulding is obtained from the detail.

The long dimension of a panel is known as its "side", and the short dimension as the "end".

In square sections, sides are determined to conform to the direction of adjacent rectangular sections.

Measurements should allow a slight over-length to permit a "snap" or "spring" fit.

Note:

Note that the space from beam web, bulkhead, or plane of intersecting sheathing to heel of support angle determines the width of moulding required. Study Details 1- A, D, E, F, and J. (See Fig. 1.)

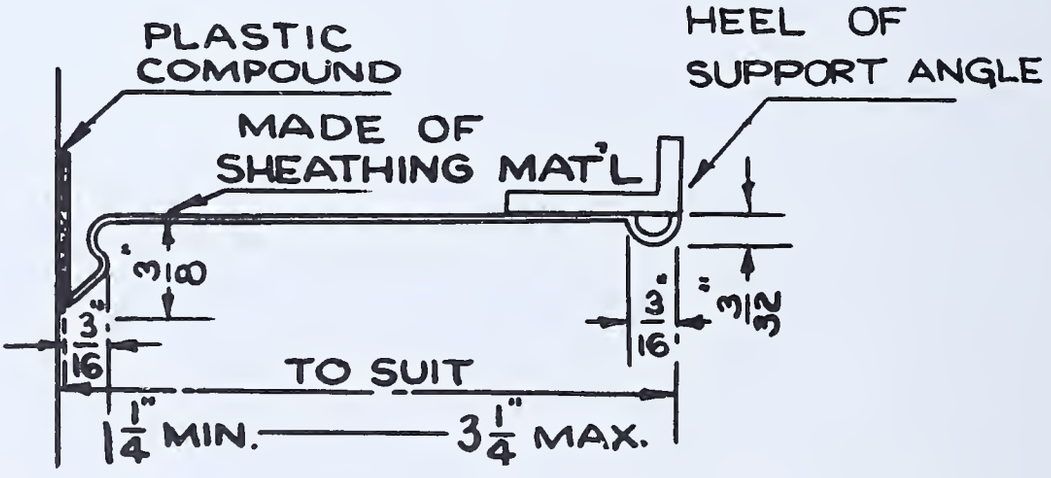


FIG. 1 — MOULDING AT BOUNDARIES

Specifications:

See drawing for type of moulding desired.

Tools needed:

Rule
Pencil

Materials needed:

Paper or cardboard for sketches

Procedure:

1. Measure distance from heel of angle support to face of intersecting line of sheathing or other structure for over-all width of moulding.

2. Secure from detail the type of moulding to be used.

3. Sketch end view, showing adaptations to conform to job requirements.

4. Measure length of boundaries of spaces which are to receive mouldings.

Questions:

1. When moulding cannot be measured, how can it be lifted?

2. How is width of moulding determined?

3. How is length of moulding determined?

FABRICATING MOULDING

Objectives:

1. To learn how to fabricate moulding in a shop.
2. To learn how to cut ends for installation.

General Information:

The drop brake has special dies for forming mouldings. Usually lengths of various types of moulding are prepared and kept in stock. As ordered they are cut to length and supplied the field crews. Occasionally, however, special types necessitate shop fabrication.

Material is usually taken from strips of sheathing stock.

Specifications:

Fabricate moulding in accordance with job requirements. See Details 1-A and 1-J

Tools needed:

Rule
Scriber
Shear

Equipment needed:

Appropriate Special Dies
Drop Brake

Materials needed:

.03125 M.W. steel

Procedure:

1. Cut and bend experimental piece of metal to get necessary width of sheathing. (Depends upon pattern of die and gauge of material).

2. Cut to strips of necessary widths and over-lengths.

3. Form on drop-brake or beading machine.

   Note: Sequence of making the beading depends upon whichever die happens to be in the drop brake.

Questions:

1. How is proper width of stock for moulding determined?

2. What is last operation step in fabrication of moulding?

3. Give by steps the machine operations used in fabrication of moulding.

INSTALL MOULDINGS

Objective:

To learn how to install moulding on ship.

General Information:

This is finish work, and care should be taken to install neatly. Corners of moulding join at 45° miter for square corners. Other angles are halved, for each member. Butt joints are made as shown in Fig. 2.

Longest dimensions of panel are called "sides". The ends of these pieces are cut square, and single bead is notched (Fig. 1, Piece A). The shorter pieces are called "ends" and are notched and mitered (Piece B).

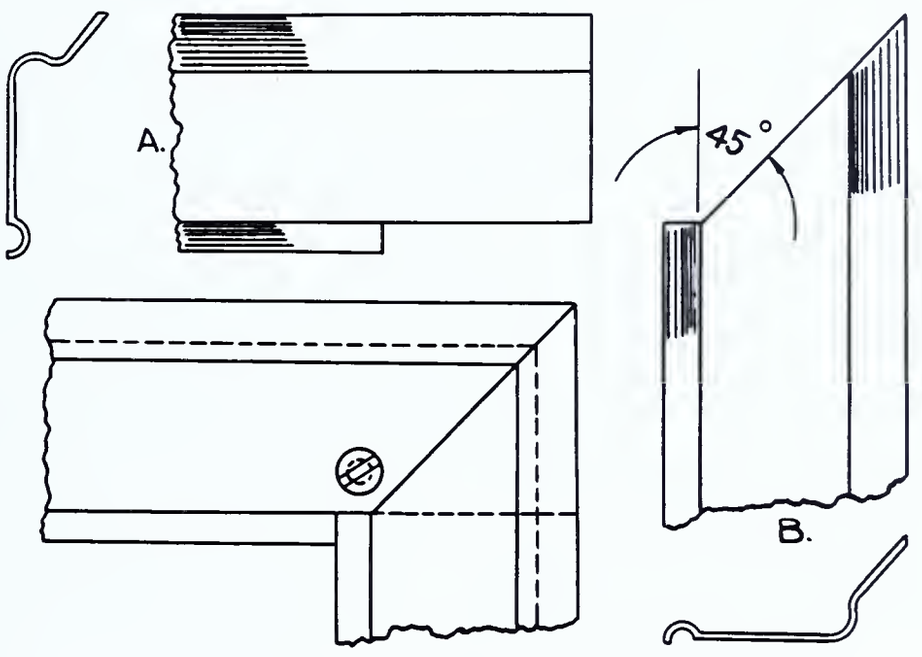


FIG. 1 — DETAIL AT CORNER OF MOULDING

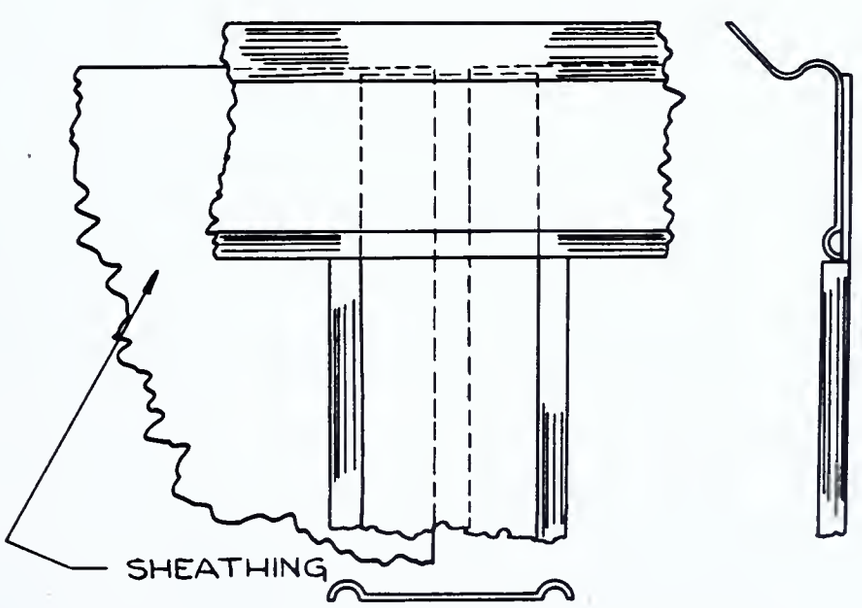


FIG. 2 — DETAIL OF INTERMEDIATE MOULDING

Tools needed:

Rule
Straight Shears
Aviation Shears
Screw Driver
Hammer
Center Punch
Half Round File
Drills for #10 self-tapping screws

Equipment needed:

Electric Drill

Material:

Non-Corrosive Sealing Compound
#10 self-tapping screws

Procedure:

1. Cut moulding to length for "sides" of panel. Notch as shown in Fig. 1 (Piece A).

2. Place compound or fiber strip in single and double beads of moulding as shown in Details 1 A, B, E, or J.

3. Place side moulding strips in position. (Note: A careful slight over-length will provide a "snap" fit, which will hold moulding in position until screws can be inserted.)

4. Cut "end" moulding, Piece B, with ends mitered to fit over Piece A as shown in Fig. 1. Fit corners neatly.

5. Drill a hole near one corner, Fig. 1, through the moulding, sheathing, and boundary bar. See Details 1-J, K, L. Be sure moulding is on proper line and sprung against boundaries.

6. Insert #10 self-tapping screw and tighten.

7. Drill another hole 24" away and repeat.

8. Continue around moulding.

9. Fit and place any intermediate moulding.

10. Drill holes and insert intervening screws at 3" centers (usually done by follow-up "screw" gang).

11. Clear away all excess compound or projecting fiber with putty knife or scraper.

Questions:

1. What type corner connection is used for moulding?
2. What moulding is cut first?
3. What angle will moulding be on 90° corner?
4. What do you use to clear away excess non-corrosive compound?
5. What joint is used where short intermediate moulding joins longer piece?

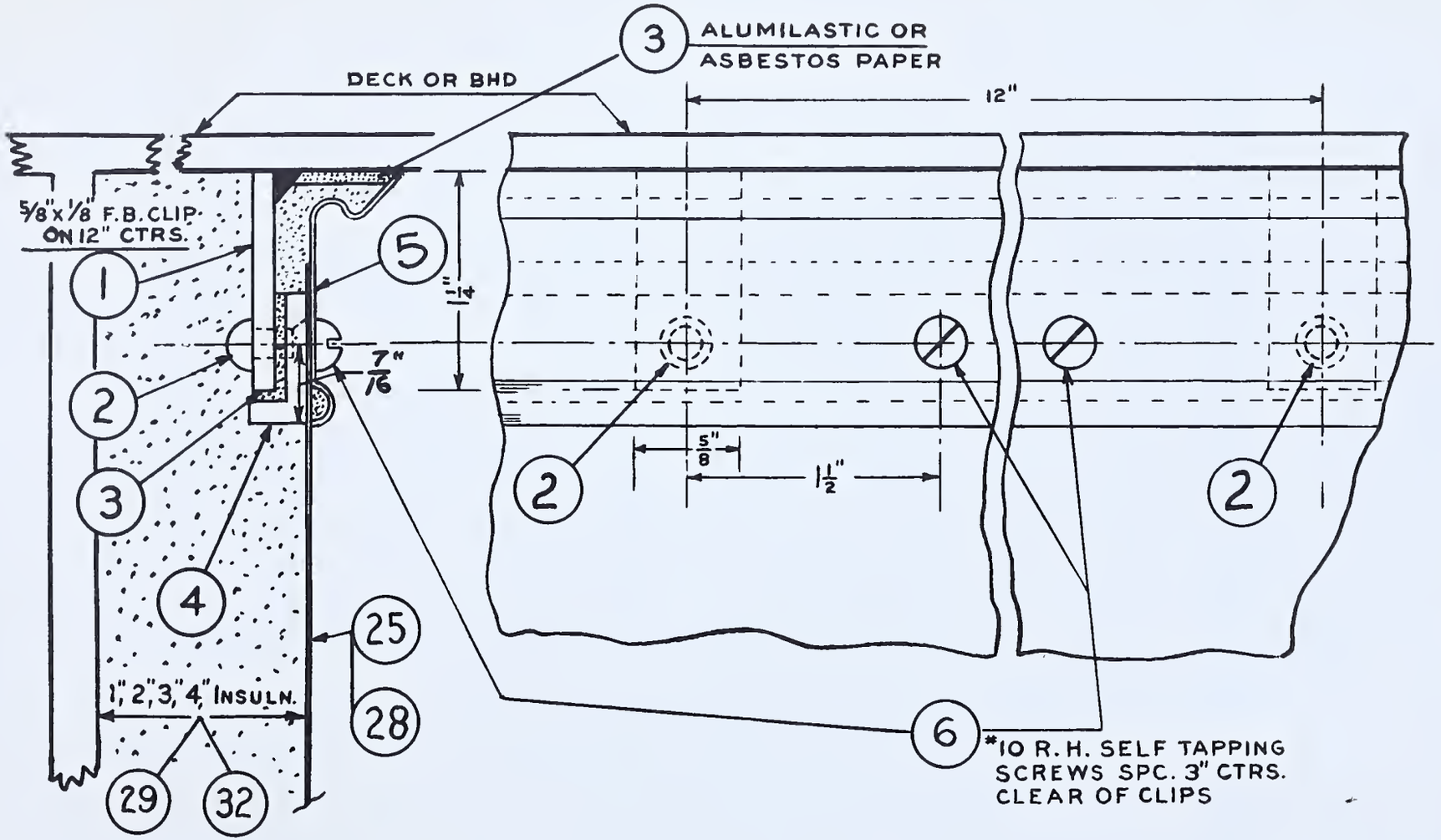
PART IV

WORKING DETAILS, DESCRIPTIONS AND QUESTIONS

INTRODUCTION

The following details are taken from shipyard plans, and their careful study will greatly assist understanding of the various processes. The first group is accompanied by explanation and questions to assure a more complete knowledge of plan reading in this field.

With this ability the trainee should have little trouble in following any typical drawing relating to the process of sheathing.



CONNECTION AT UNDERSIDE OF DECK & AT BOUNDARIES OF COMPARTMENTS

· DETAIL-1-A ·

0 8 1 2

SCALE

DETAIL 1-A

CONNECTION AT UNDERSIDE OF DECK AND AT BOUNDARIES OF COMPARTMENTS

DESCRIPTION:

Figures in circles are known as Piece Numbers.

Piece No. 1 is a steel flat bar clip welded to structure at intervals.

Piece No. 2 is a rivet connecting pieces No. 1 and No. 4 together.

Piece No. 3 is a non-corrosive compound.

Piece No. 4 is a continuous angle between the boundaries of space to be insulated.

Piece No. 5 is a moulding for closing the boundaries insulated.

Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to Piece No. 4.

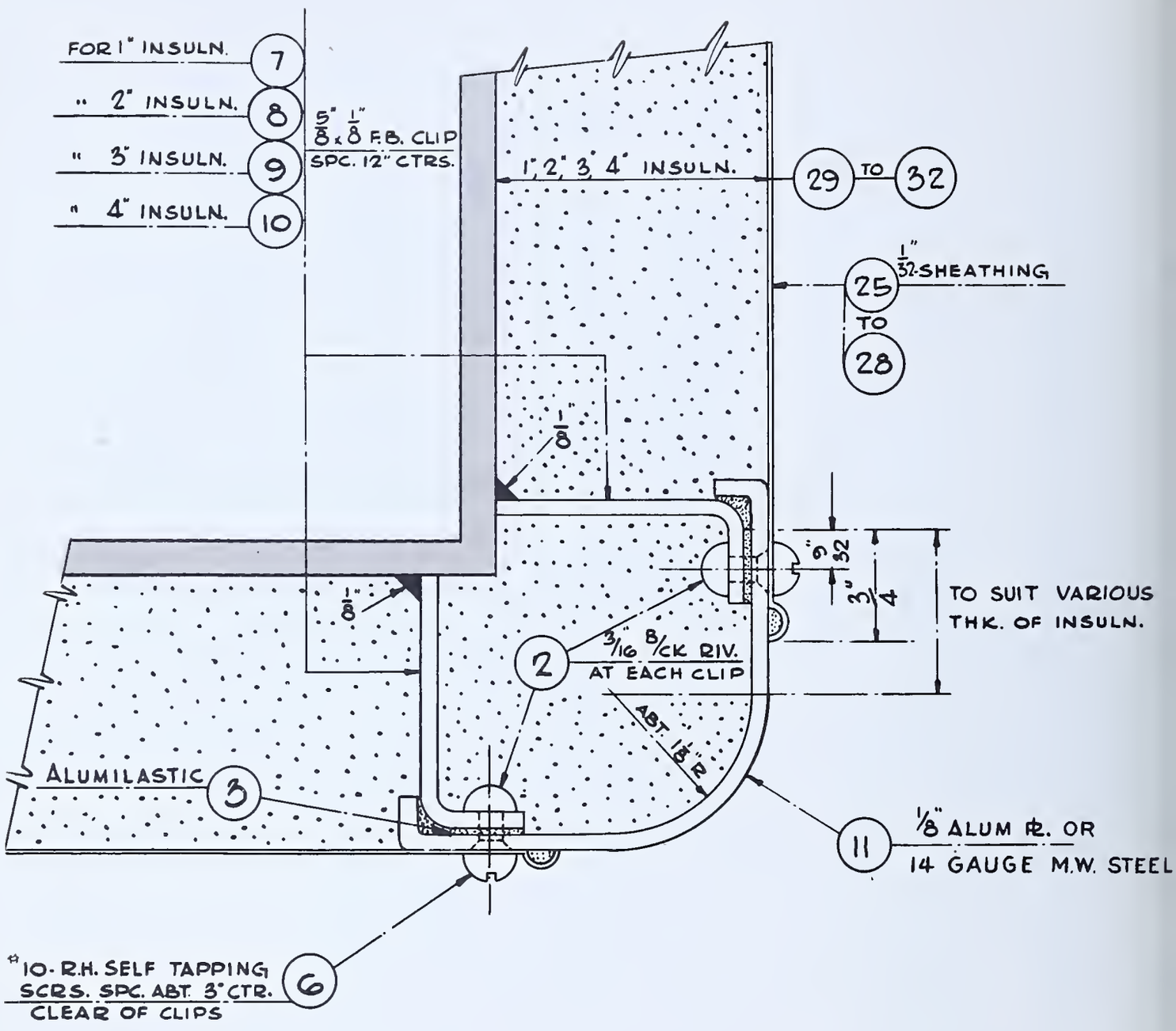
Piece No. 25 - 28 is the covering or sheathing over the insulation.

Piece No. 29 - 32 is the insulation.

ASSIGNMENT SHEET

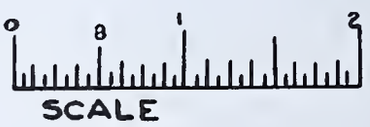
Note: Read each question, locate the answer on drawing Detail 1-A, then record the answer as instructed.

1. What is the name of Piece No. 1?
2. State the size of Piece No. 1.
3. State the distance from boundaries of compartment to Piece No. 1, assuming 2" insulation is specified.
4. What is the spacing for installing Piece No. 1?
5. How is Piece No. 1 secured to deck?
6. What is Piece No. 2?
7. State size of Piece No. 2.
8. What is Piece No. 4?
9. State the dimensions of Piece No. 4.
10. How is Piece No. 4 secured to Piece No. 1?
11. How is sheathing secured?
12. What is the spacing of self-tapping screws?
13. What size self-tapping screws are specified?
14. What is the distance between pieces No. 2 and No. 6?


FOR 1" INSULN. 7
" 2" INSULN. 8
" 3" INSULN. 9
" 4" INSULN. 10
5/8 x 1/8 F.B. CLIP SPC. 12" CTRS.
1", 2", 3", 4" INSULN. 29 TO 32
1/32" SHEATHING 25 TO 28
1/8"
1/8"
9/32"
3/4"
TO SUIT VARIOUS THK. OF INSULN.
3/16" B/CK RIV. AT EACH CLIP 2
ABT. 1 1/8" R.
ALUMILASTIC 3
1/8" ALUM PL. OR 14 GAUGE M.W. STEEL 11
*10-R.H. SELF TAPPING SCRS. SPC. ABT. 3" CTR. CLEAR OF CLIPS 6

TYPICAL DETAIL OF STIFFENING AT OVERHEAD & VERTICAL OUTSIDE CORNERS

· DETAIL-1B ·



DETAIL 1-B

TYPICAL DETAIL SHOWING STIFFENING AT OVERHEAD AND VERTICAL OUTSIDE CORNERS

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 2 is a rivet connecting Piece No. 7, 8, 9, 10 to Piece No. 11.

Piece No. 3 is a non-corrosive sealing compound.

Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to Piece No. 11.

Piece No. 7 is a steel flat bar clip, flanged and welded to structure at intervals.

Piece No. 8, 9, or 10 is similar to Piece No. 7.

Piece No. 11 is a corner plate.

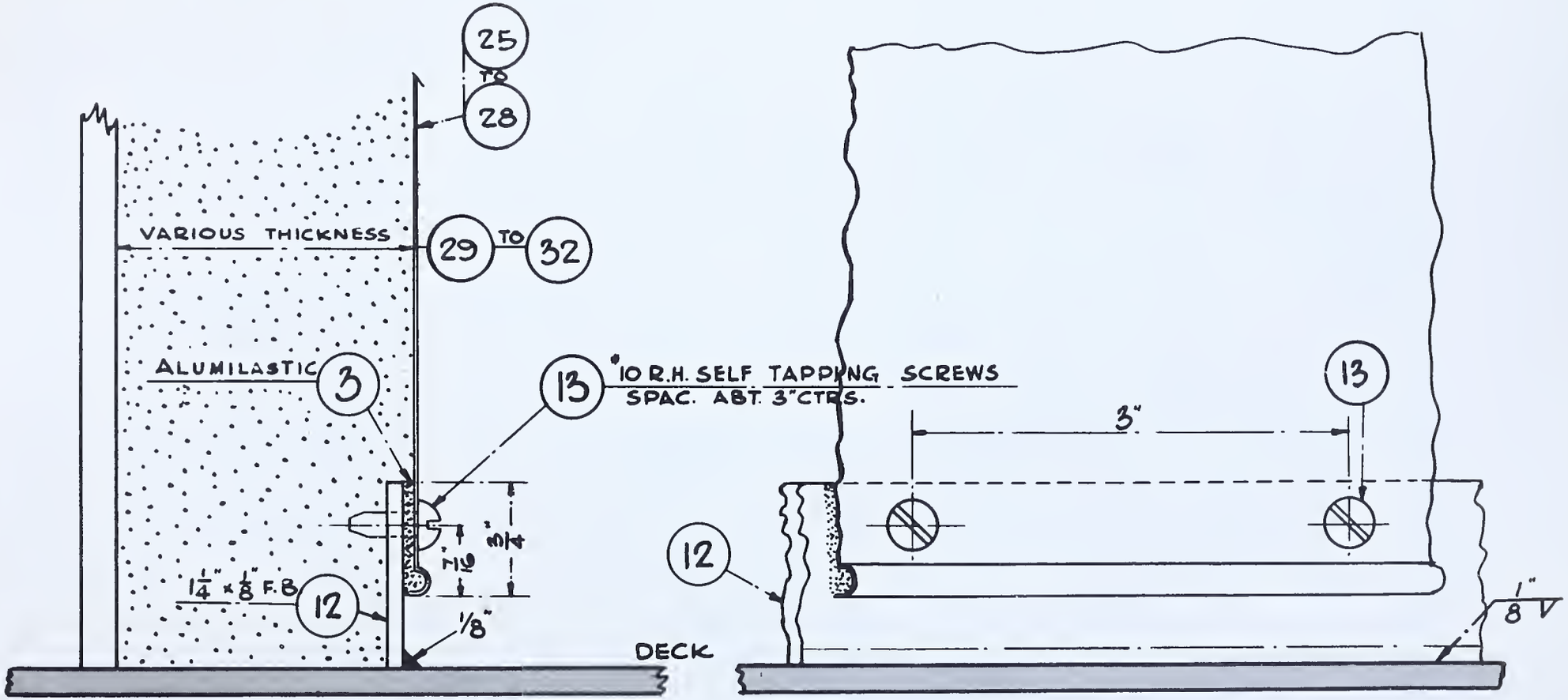
Piece No. 25 - 28 is the covering or sheathing over the insulation.

Piece No. 29 - 32 is the insulation.

ASSIGNMENT SHEET

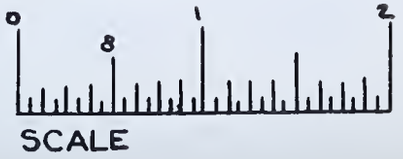
Note: Read each question, locate the answer on Detail Drawing No. 1-B, and then record the answer as instructed.

1. How would you determine size of piece No. 7 by deducting No. 11 and No. 3?
2. What is the meaning of " 1/8" " at clips?
3. What is the location of Piece No. 11.
4. State the thickness of Piece No. 11.
5. State the width of Piece No. 11 for 1" insulation.
6. State width of Piece No. 11 for 4" insulation.
7. State thickness of sheathing.
8. Specify size of rivets to secure Piece No. 11 to clips.
9. Specify size of self-tapping screw.
10. State distance from vertical outside corner of structure to 5/8" x 1/8" F.B. clip.



WELDED CONNECTION WHERE INSULATION AT BOTTOM IS CARRIED TO DECK

· DETAIL - 1-C ·



DETAIL 1-C

WELDED CONNECTION WHERE INSULATION AT BOTTOM IS CARRIED TO DECK

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 3 is a non-corrosive sealing compound.

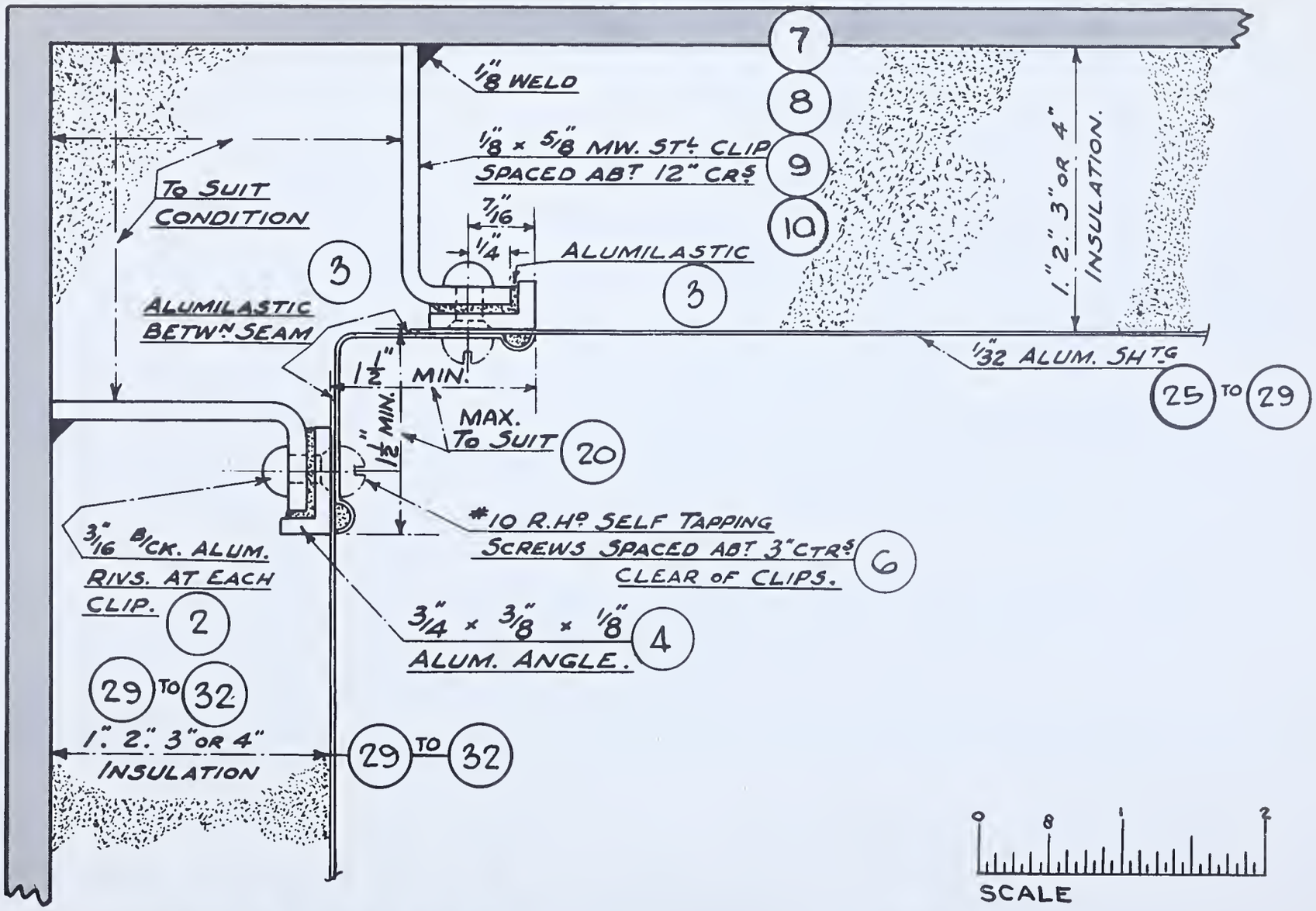
Piece No. 12 is continuous steel flat bar.

Piece No. 13 is a self-tapping screw, type "F", connecting sheathing to Piece No. 12.

ASSIGNMENT SHEET

Note: Read each question, locate the answer on Detail Drawing No. 1-C, and then record the answer as instructed.

1. What is the name of Piece No. 12?
2. What is the size of Piece No. 12?
3. State distance from shell to Piece No. 12, assuming the insulation is 3" in thickness.
4. What does the symbol $\sqrt{\frac{1"}{8V}}$ mean?
5. What is the specified sheathing lap?
6. What is the name of Piece No. 13?
7. State the number of "Piece No. 13" required to secure sheathing to a flat bar 12'-0" long.
8. State distance from deck to ℄ of Piece No. 13.
9. State distance from deck to bead of sheathing.
10. Does distance from deck to bead of sheathing vary at points along the deck?



TYPICAL METHOD OF STIFFENING AT OVERHEAD & VERTICAL INSIDE CORNERS.

· DETAIL- I.D ·

DETAIL 1-D

TYPICAL METHOD OF STIFFENING AT OVERHEAD AND VERTICAL INSIDE CORNERS

DESCRIPTION

Figures in circles are known as piece Numbers.

Piece No. 2 is a rivet connecting pieces No. 1 and No. 4 together.

Piece No. 3 is a non-corrosive sealing compound.

Piece No. 4 is a continuous angle between the boundaries of space to be insulated.

Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to Piece No. 4.

Piece No. 7 is a steel flat bar clip, flanged and welded to structure at intervals.

Piece No. 8, 9, or 10 is similar to Piece No. 7.

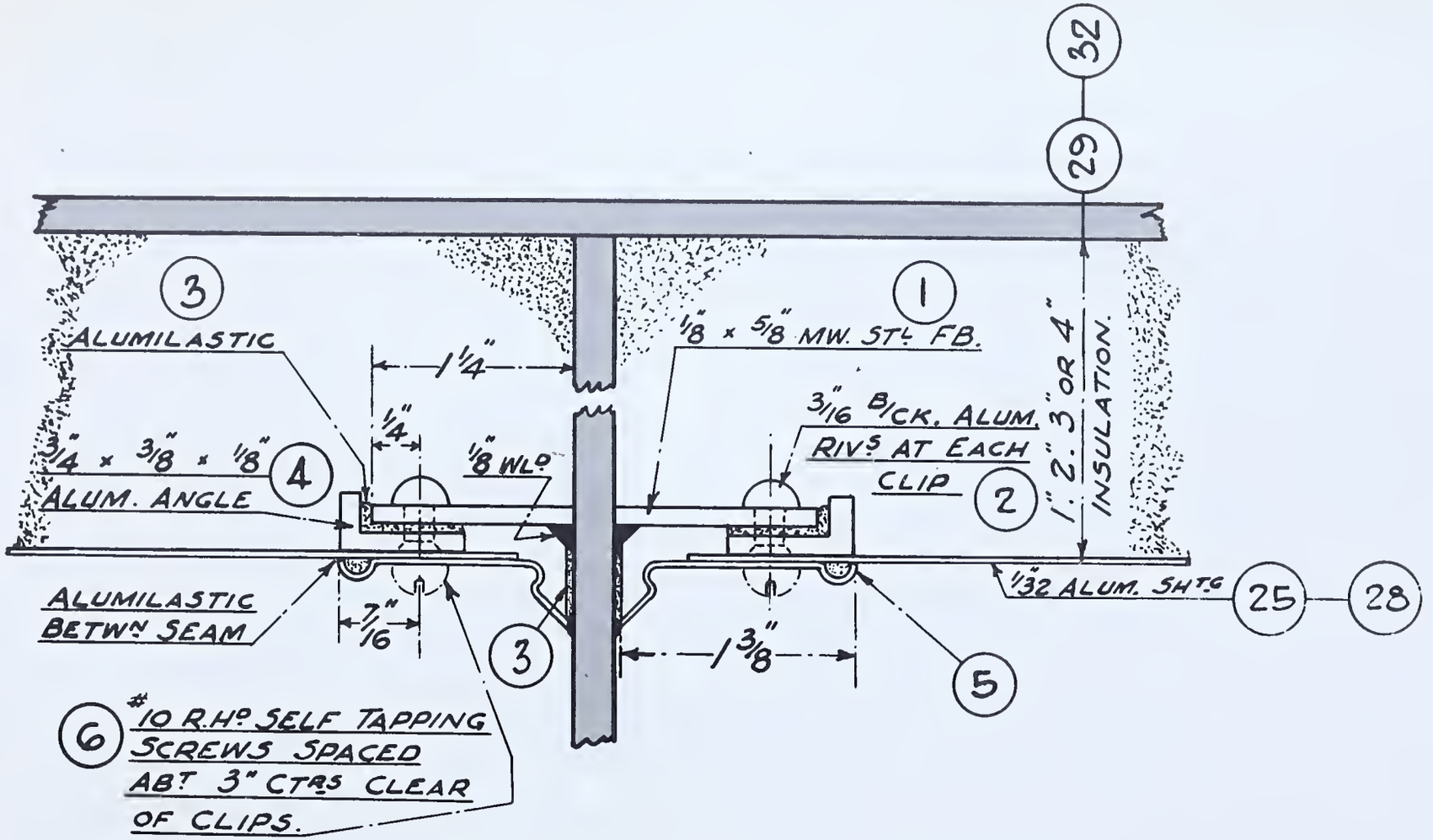
Piece No. 25 - 28 is the covering or sheathing over the insulation.

Piece No. 29 - 32 is the insulation.

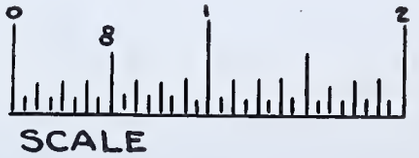
ASSIGNMENT SHEET

Note: Read each question, locate the answer on Detail Drawing No. 1-D, and then record the answer as instructed.

1. What type of sheet metal work is this called?
2. What thickness of aluminum is shown in this drawing?
3. What size of M.W. steel clip is used in this drawing?
4. What size of self-tapping screws is used?
5. How are the sheets stiffened around edges?
6. What size of weld is used to fasten clips?
7. What size rivet is used at clip No. 2?
8. What size aluminum angle is specified?
9. Specify the size of clips for 1" insulation.
10. Specify the size of clips for 2" insulation.
11. Specify the size of clips for 4" insulation.



MOULDING, SUPPORT & F.B. CLIPS TO STIFFRS. BEAMS, LONGLS & GIRDERS AS MAY BE PRACTICABLE TO FIT.



·DETAIL I-E·

DETAIL 1-E

MOULDING, SUPPORT, AND FLAT BAR CLIPS TO STIFFENERS, BEAMS, LONGITUDINALS AND GIRDERS AS MAY BE PRACTICABLE TO FIT

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 1 is a steel flat bar clip welded to structure at intervals.

Piece No. 2 is a rivet connecting Pieces No. 1 and No. 4 together.

Piece No. 3 is a non-corrosive sealing compound.

Piece No. 4 is a continuous angle between the boundaries of space to be insulated.

Piece No. 5 is a moulding for closing the boundaries insulated.

Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to Piece No. 4.

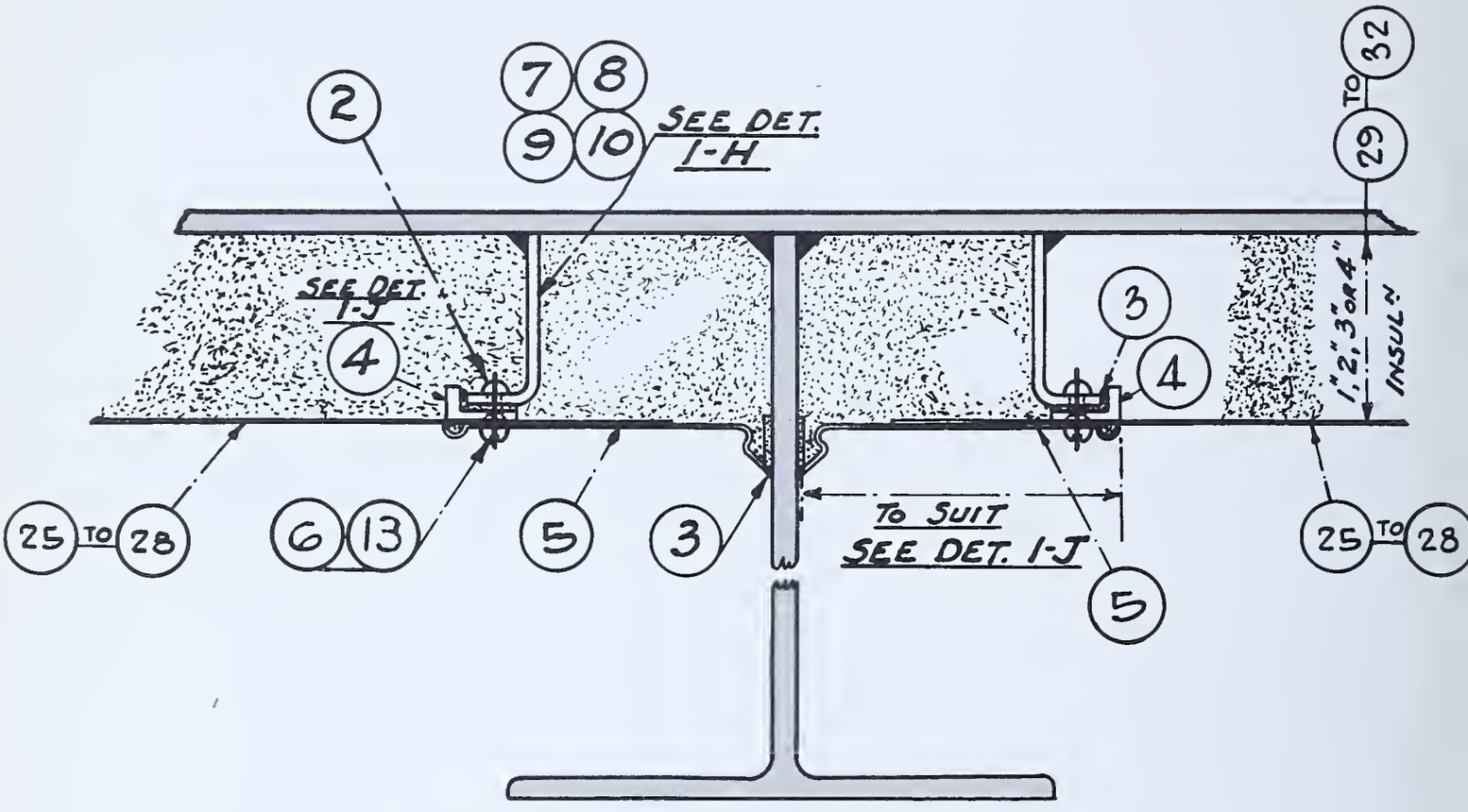
Piece No. 25 - 28 is the covering or sheathing over the insulation.

Piece No. 29 - 32 is the insulation.

ASSIGNMENT SHEET

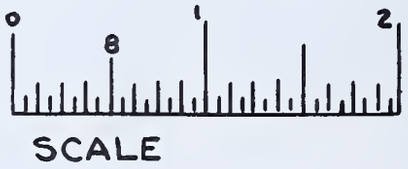
Note: Read each question, locate the answer on Detail Drawing No. 1-E, then record the answer as instructed.

1. What does symbol B/CK alum. rivs. mean?
2. What is size of Piece No. 1?
3. What is Piece No. 4?
4. What is thickness of sheathing?
5. Is Piece No. 1 or Piece No. 4 non-ferrous?
6. State distance from deck to Piece No. 1 for 1" insulation.
7. State distance from deck to Piece No. 1 for 2" insulation.
8. State distance from deck to Piece No. 1 for 4" insulation.
9. What does symbol 1/8" wld. mean?
10. What is size of Piece No. 1 for 4" insulation?



DETAIL IN WAY OF BEAMS, LONGLS OR GIRDERS WHERE DETAIL 1-E IS NOT PRACTICABLE AT ALL BOUNDARIES.

· DETAIL 1-F ·



DETAIL 1-F

DETAIL IN WAY OF BEAMS, LONGITUDINALS OR GIRDERS WHERE DETAIL 1-E IS NOT PRACTICABLE AT ALL BOUNDARIES

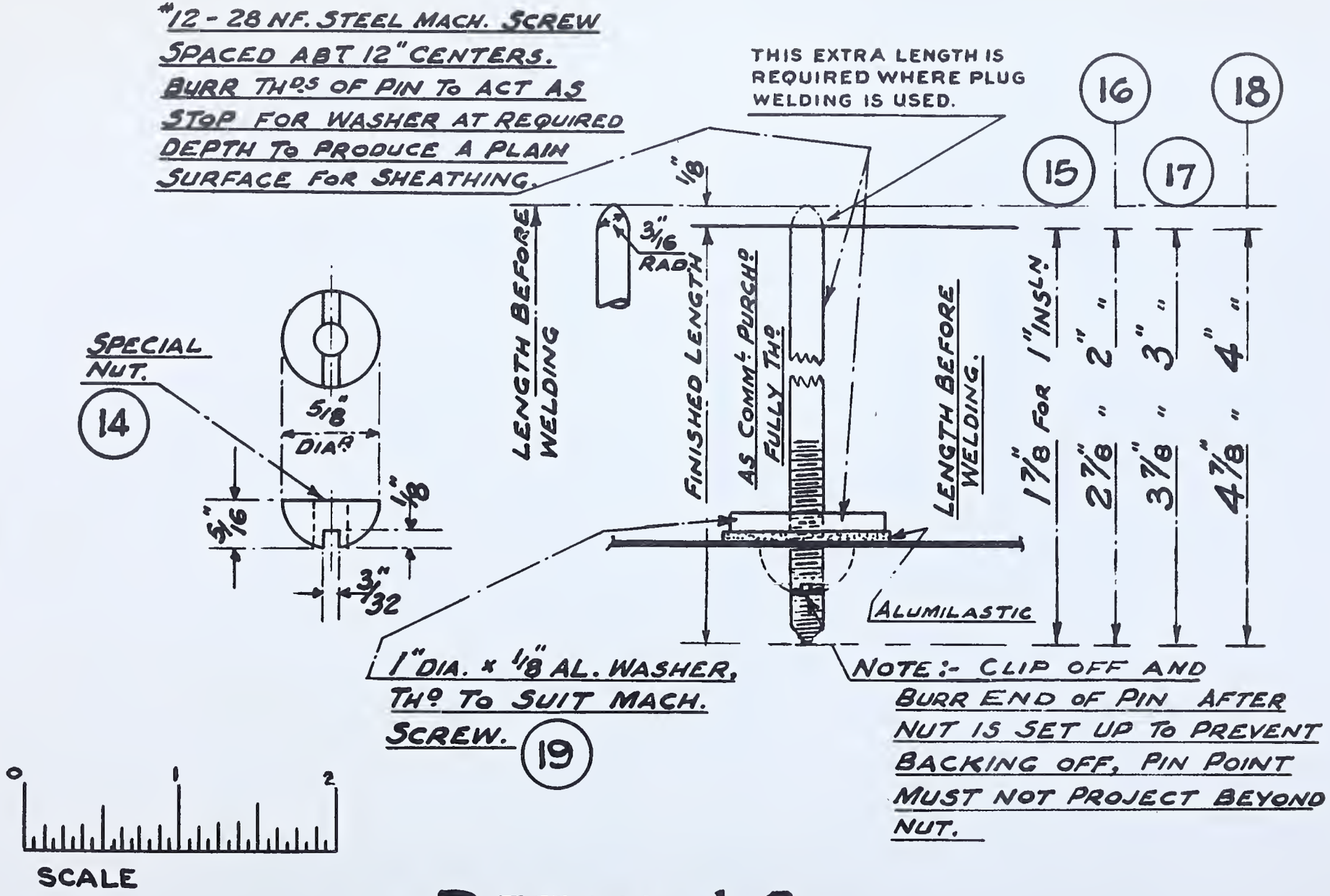
DESCRIPTION

Figures in circles are known as Piece Numbers.
Piece No. 2 is a rivet connecting Pieces No. 1 and No. 4 together.
Piece No. 3 is a non-corrosive sealing compound.
Piece No. 4 is a continuous angle between the boundaries of space to be insulated.
Piece No. 5 is a moulding for closing the boundaries insulated.
Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to Piece No. 4.
Piece No. 7 is a steel flat bar clip, flanged and welded to structure at intervals.
Piece No. 8, 9, or 10 is similar to Piece No. 7.
Piece No. 25 - 28 is the covering or sheathing over the insulation.
Piece No. 29 - 32 is the insulation.

ASSIGNMENT SHEET

Note: Read each question, locate the answer on Detail Drawing No. 1-F, and then record the answer as instructed.

1. What is the name of Piece No. 7?
2. How is Piece No. 7 fastened to deck?
3. State distance from beam to piece No. 7?
4. State length of No. 7 flat bar clip (deck to bottom of flange).
5. State length of No. 9 flat bar clip (deck to bottom of flange).
6. State length of No. 10 flat bar clip (deck to bottom of flange).
7. What is name of Piece No. 4?
8. How is piece No. 4 secured to No. 7?
9. How is the sheathing secured to Piece No. 4?
10. What is Piece No. 3?
11. What type of metal is Piece No. 4?
12. Give the ℄ to ℄ measurements of No. 7 - 10.
13. What is Piece No. 2?
14. What is Piece No. 6?


#12 - 28 NF. STEEL MACH. SCREW SPACED ABT 12" CENTERS. BURR THDS OF PIN TO ACT AS STOP FOR WASHER AT REQUIRED DEPTH TO PRODUCE A PLAIN SURFACE FOR SHEATHING.
THIS EXTRA LENGTH IS REQUIRED WHERE PLUG WELDING IS USED.
16
18
15
17
1/8"
3/16" RAD
LENGTH BEFORE WELDING
FINISHED LENGTH
AS COMM'L PURCH'D FULLY THD
LENGTH BEFORE WELDING.
17/8" FOR 1" INSLN
2" " 2"
2 7/8" " 3"
3 7/8" " 4"
4 7/8" "
SPECIAL NUT.
14
5/8" DIAR
5/16"
1/8"
3/32"
ALUMILASTIC
1" DIA. x 1/8" AL. WASHER, THD TO SUIT MACH. SCREW.
19
NOTE:- CLIP OFF AND BURR END OF PIN AFTER NUT IS SET UP TO PREVENT BACKING OFF, PIN POINT MUST NOT PROJECT BEYOND NUT.
0
1
2
SCALE

·DETAIL 1-G·

INSTALLATION OF QUILTING SCREW SHOWING WASHER & NUT

DETAIL 1-G

QUILTING PIN

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 14 is a special nut.

Piece No. 15 is the Quilting Pin for 1" Insulation.

Piece No. 16 is the Quilting Pin for 2" Insulation.

Piece No. 17 is the Quilting Pin for 3" Insulation.

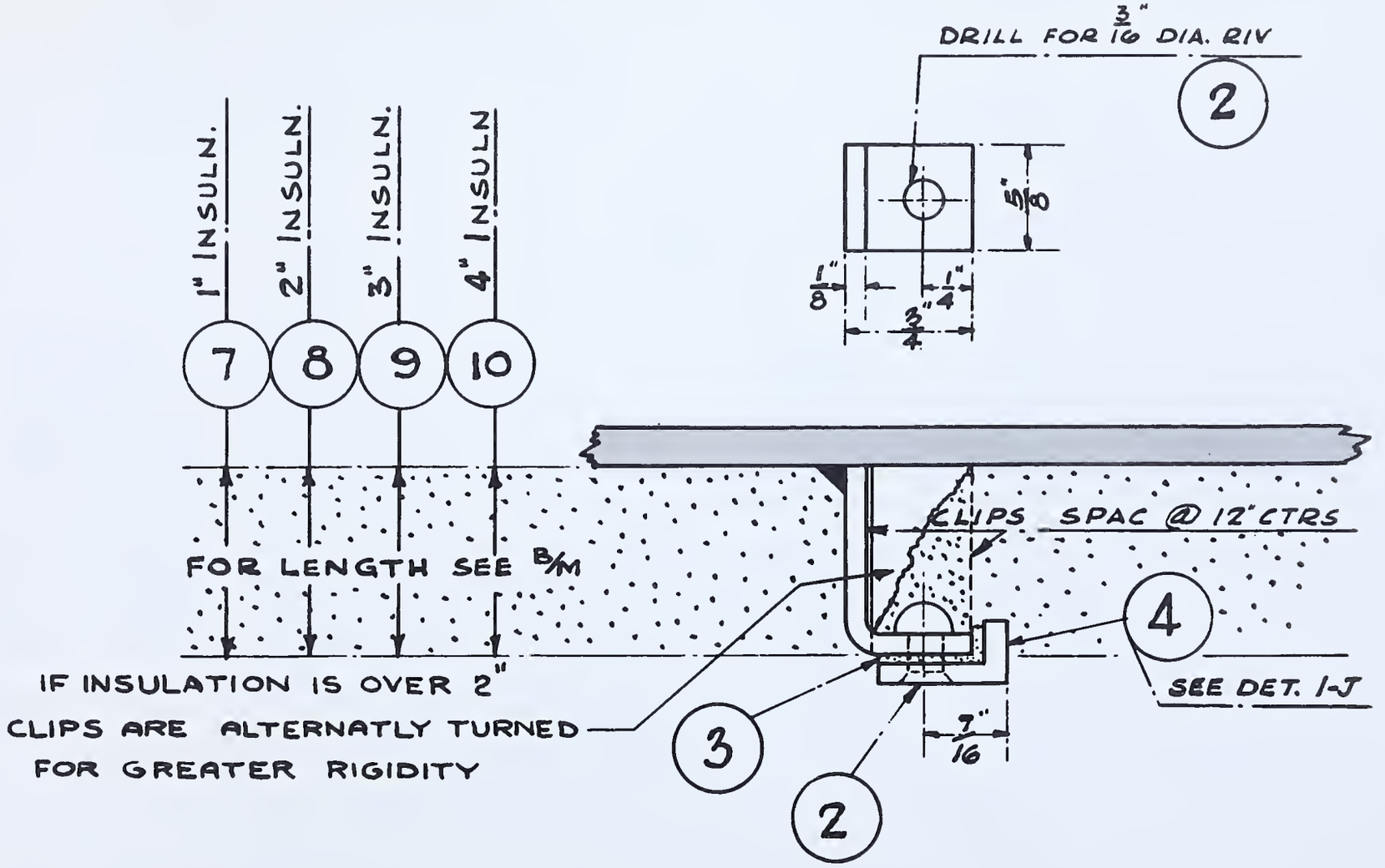
Piece No. 18 is the Quilting pin for 4" Insulation.

Piece No. 19 is a washer used as a distance piece.

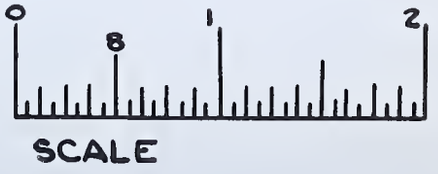
ASSIGNMENT SHEET

Note: Read each question, locate the answer on Detail Drawing No. 1-G, then record the answer as instructed.

1. What is the diameter of the special nut?
2. State the thickness of the special nut.
3. Specify the size and finish of hole in special nut.
4. State length of quilting pin for 4" insulation.
5. State length of quilting pin for 1" insulation.
6. How is quilting pin secured to shell?
7. State the shape of "shell end" of quilting pin.
8. State the shape of "nut end" of quilting pin.
9. State the dimensions of washer.
10. How many quilting pins are required to insulate an area six (6) feet square?
11. State the type of quilting pin specified.



• CLIP & AL. ANGLE AT SEAMS IN GENERAL & ELSEWHERE AS MAY BE NECESSARY TO SUIT CONDITION



• DETAIL 1-H •

DETAIL 1-H

CLIP AND ALUMINUM ANGLE AT SEAMS IN GENERAL AND ELSEWHERE AS MAY BE NECESSARY TO SUIT CONDITIONS

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 2 is a rivet connecting Piece No. 7, 8, 9, or 10 to Piece No. 11.

Piece No. 3 is a non-corrosive compound, used as a sealer and insulator.

Piece No. 4 is a continuous angle between the boundaries of space to be insulated.

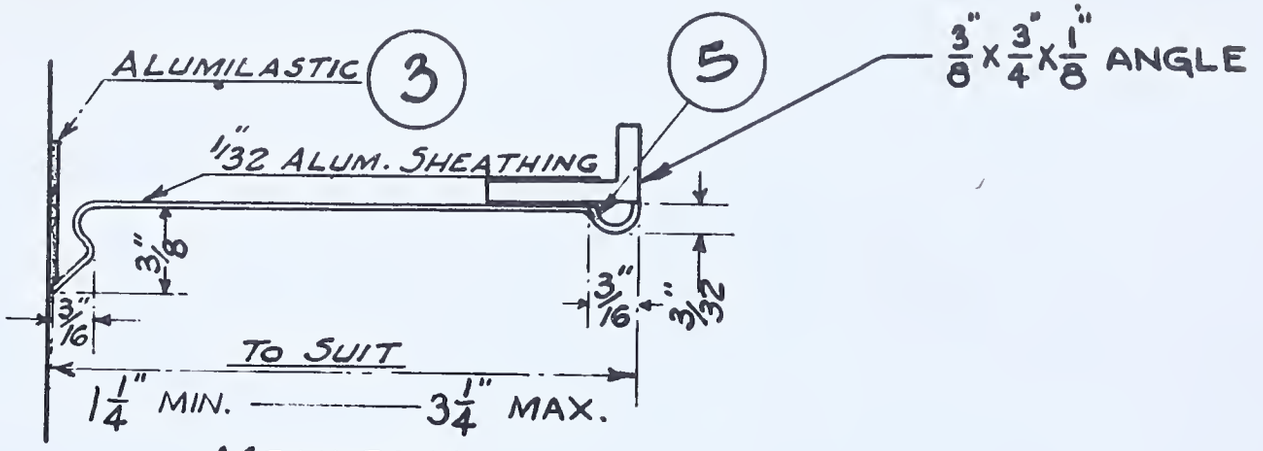
Piece No. 7 is a steel flat bar flanged to form a clip welded to the structure at intervals.

Piece No. 8, 9, or 10 is similar to Piece No. 7.

ASSIGNMENT SHEET

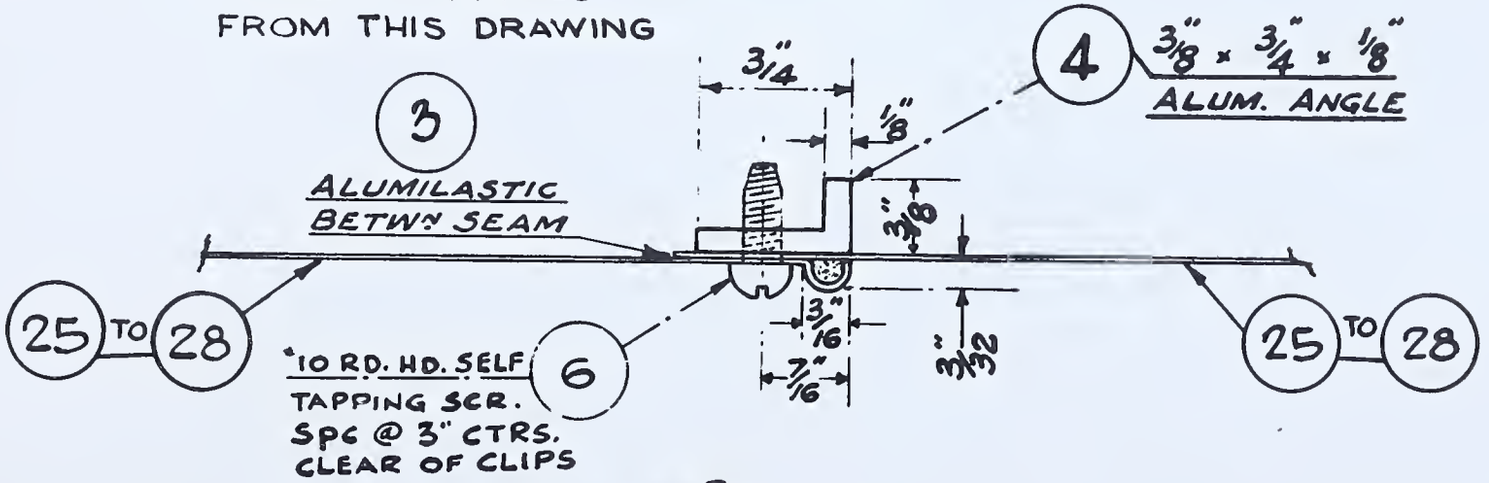
Note: Read each question, locate the answer on Detail Drawing No. 1-H, and then record the answer as instructed.

1. State the name of Piece No. 4.
2. State the size of material for making Piece No. 4.
3. State the materials used for making Piece No. 4.
4. State the drill size for Piece No. 4.
5. State the size of rivets to secure No. 4 to clip.
6. State the ℄ distance between clips.
7. What does the symbol B/M mean?
8. State the length of Piece No 7.
9. State the length of Piece No. 8.
10. State the length of Piece No. 9.
11. State the length of Piece No. 10.
12. What detail drawing will give additional information on Piece No. 4?



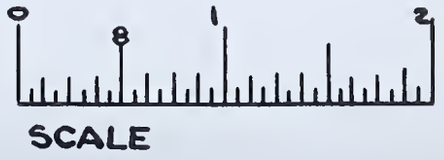
MOULDING

SUPPORT CLIPS & RIVETS OMITTED FROM THIS DRAWING



SEAM

DETAIL OF MOULDING & SEAM.



· DETAIL - I-J ·

DETAIL 1-J

DETAIL OF MOULDING AND SEAM

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 3 is a non-corrosive compound used as a sealer and insulator.

Piece No. 4 is a continuous angle between the boundaries of space to be insulated.

Piece No. 5 is a moulding for closing the boundaries of space insulated.

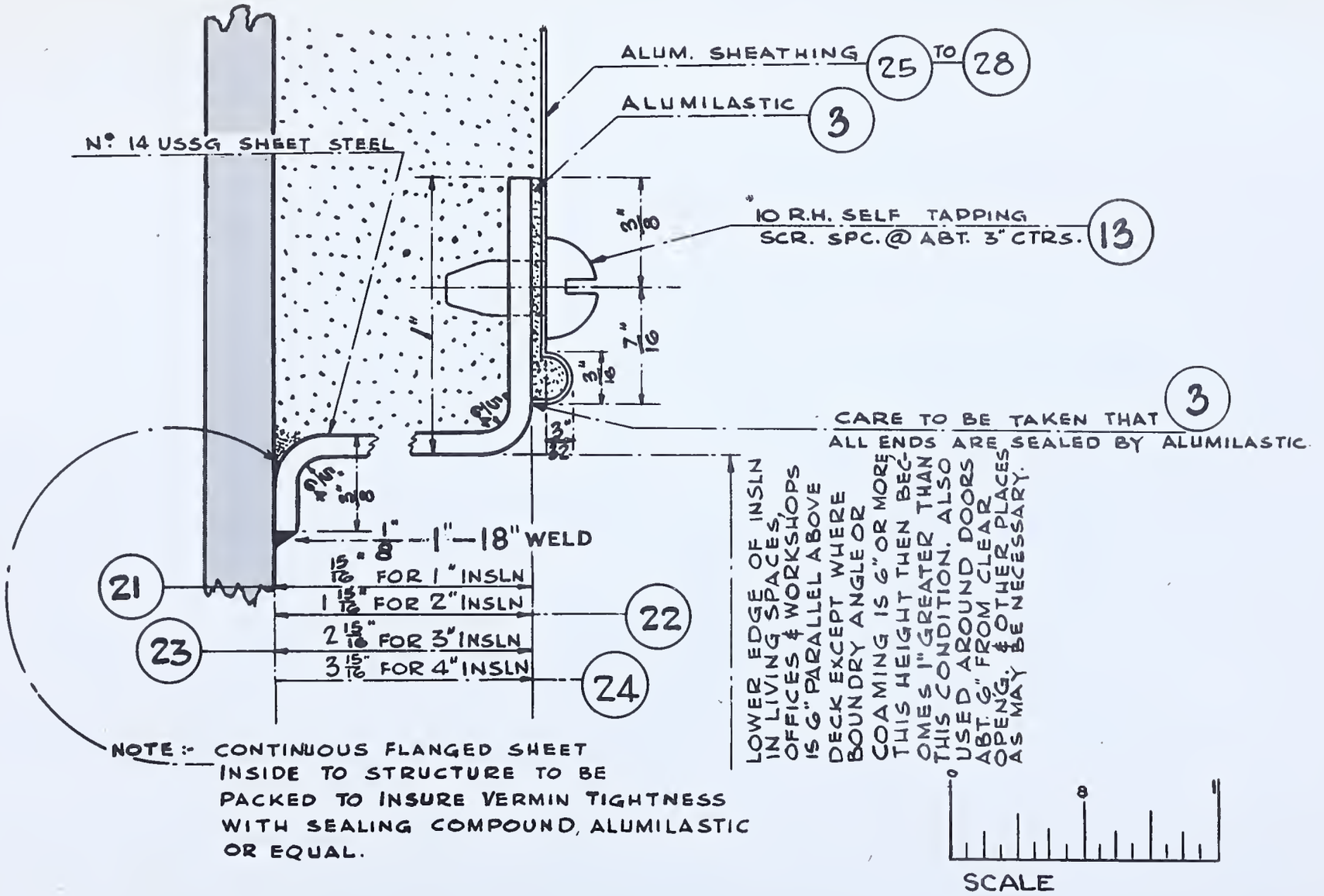
Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to Piece No. 4.

Piece No. 25 - 28 is the covering or sheathing over the insulation.

ASSIGNMENT SHEET

Note: Read each question, locate the answer on Detail Drawing No. 1-J, and then record the answer as instructed.

1. Name Item No. 6.
2. What is the size of Piece No. 4?
3. Name Piece No. 4.
4. What is the depth of bead?
5. Where is Piece No. 6 used?
7. What is the thickness of sheathing?
8. What are the flange widths of Piece No. 4?
9. What is the ℄ spacing of Piece No. 6?


ALUM. SHEATHING 25 TO 28
ALUMILASTIC 3
N° 14 USSG SHEET STEEL
10 R.H. SELF TAPPING SCR. SPC. @ ABT. 3" CTRS. 13
3 3/8"
7 7/16"
3 3/16"
3 3/32"
CARE TO BE TAKEN THAT ALL ENDS ARE SEALED BY ALUMILASTIC 3
1" — 1"—18" WELD
15/16" FOR 1" INSLN
1 15/16" FOR 2" INSLN
2 15/16" FOR 3" INSLN
3 15/16" FOR 4" INSLN
21
22
23
24
LOWER EDGE OF INSLN IN LIVING SPACES, OFFICES & WORKSHOPS IS 6" PARALLEL ABOVE DECK EXCEPT WHERE BOUNDRY ANGLE OR COAMING IS 6" OR MORE THIS HEIGHT THEN BECOMES 1" GREATER THAN THIS CONDITION. ALSO USED AROUND DOORS ABT. 6" FROM CLEAR OPENG. & OTHER PLACES AS MAY BE NECESSARY.
NOTE:- CONTINUOUS FLANGED SHEET INSIDE TO STRUCTURE TO BE PACKED TO INSURE VERMIN TIGHTNESS WITH SEALING COMPOUND, ALUMILASTIC OR EQUAL.
0
8
SCALE

TYPICAL DETAIL WHERE INSULATION AT BOTTOM STOPS ABOVE DECK, ALSO AROUND DOORS & ELSEWHERE TO SUIT COND'TN

·DETAIL-1-K·

DETAIL 1-K

TYPICAL DETAIL WHERE INSULATION AT BOTTOM STOPS ABOVE DECK, ALSO AROUND DOORS AND ELSEWHERE TO SUIT CONDITIONS

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 3 is a non-corrosive compound used as a sealed and insulator.

Piece No. 21 is a continuous sheet metal strip flanged as indicated for closing boundaries of Insulation.

Piece No. 22 is a continuous sheet metal strip flanged as indicated for closing boundaries of 2" insulation.

Piece No. 23 is a continuous sheet metal strip flanged as indicated for closing boundaries of 3" insulation.

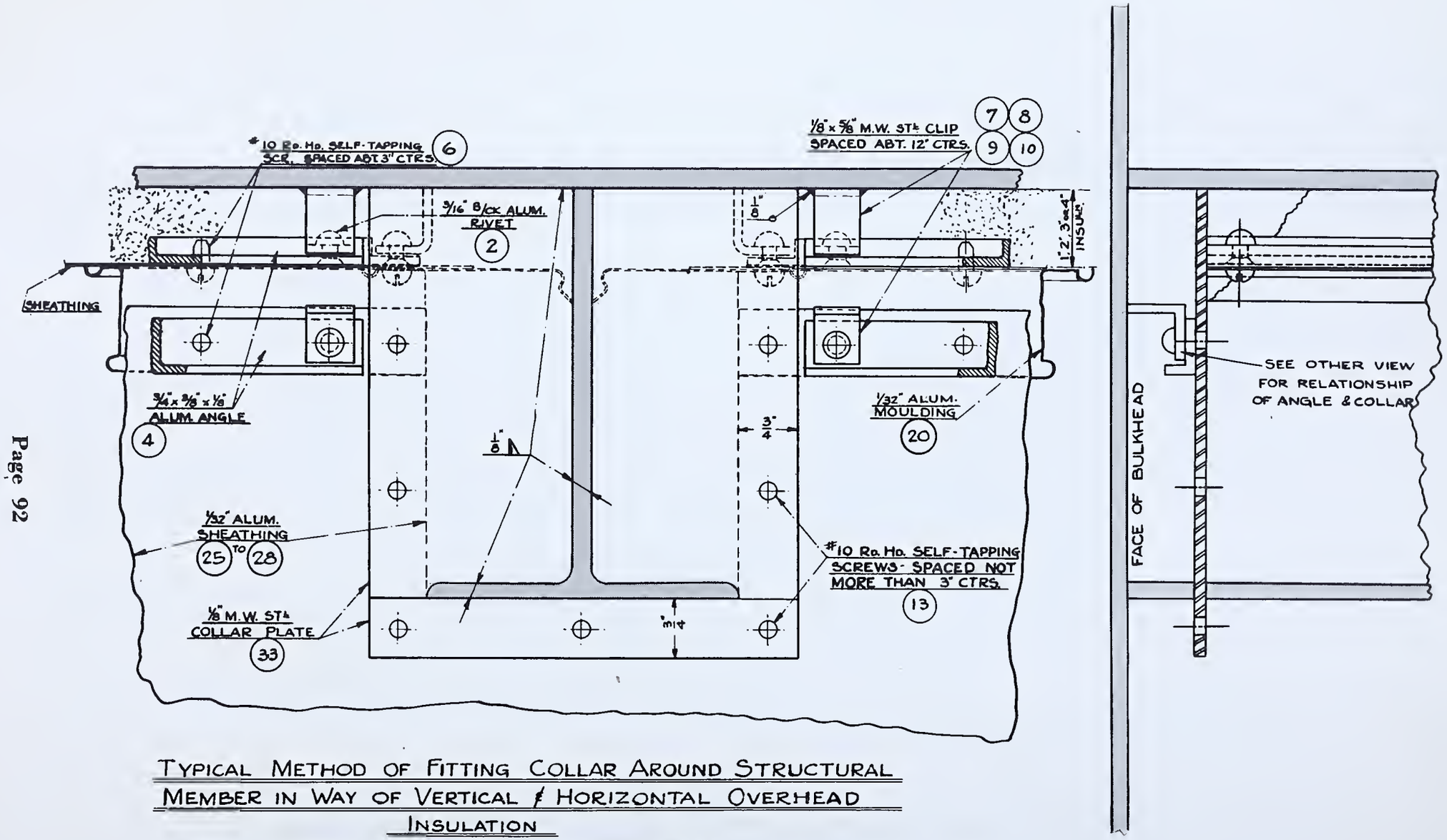
Piece No. 24 is a continuous sheet metal strip flanged as indicated for closing boundaries of 4" insulation.

Piece No. 25 - 28 is the covering or sheathing over the insulation.

ASSIGNMENT SHEET

Note: Read each question, locate the answer on Detail Drawing No. 1-K, and then record the answer as instructed.

1. What are Pieces No. 25 - 28?
2. What is the name of Piece No. 21 - 24?
3. What size of bead is used?
4. What radius is used in flanged sheet, item No. 24?
5. What thickness of metal is called for in item No. 24?
6. What is the ℄ to ℄ of the self-tapping screws?
7. How is Piece No. 21 - 24 secured to shell?
8. State distance from Piece No. 21 - 24 to clear openings around doors.
9. What material is used to insure a vermin-proof seal?
10. State size of tapping screw to secure sheathing to Piece No. 21 - 24.
11. State distance from ℄ of tapping screw to edge of sheathing.


#10 Rd. Hd. SELF-TAPPING SCR. SPACED ABT 3" CTRS. 6
1/8" x 5/8" M.W. ST'L CLIP SPACED ABT. 12" CTRS. 7 8 9 10
3/16" B/CK ALUM. RIVET 2
1/8"
1.2" 3" or 4" INSUL.
SHEATHING
3/4" x 3/8" x 1/8" ALUM. ANGLE 4
1/32" ALUM. MOULDING 20
3/4"
1/8"
1/32" ALUM. SHEATHING 25 TO 28
#10 Rd. Hd. SELF-TAPPING SCREWS SPACED NOT MORE THAN 3" CTRS. 13
1/8" M.W. ST'L COLLAR PLATE 33
FACE OF BULKHEAD
SEE OTHER VIEW FOR RELATIONSHIP OF ANGLE & COLLAR

TYPICAL METHOD OF FITTING COLLAR AROUND STRUCTURAL MEMBER IN WAY OF VERTICAL & HORIZONTAL OVERHEAD INSULATION

VIEWED FROM STRUCTURAL SIDE

DETAIL 1-L

SCALE

DETAIL 1-L

TYPICAL METHOD OF FITTING COLLAR AROUND STRUCTURAL MEMBER

IN WAY OF VERTICAL AND HORIZONTAL OVERHEAD INSULATION

DESCRIPTION

Figures in circles are known as Piece Numbers.

Piece No. 2 is a rivet connecting Piece No. 7, 8, 9, 10 to Piece No. 4.

Piece No. 4 is a continuous angle between the structural members within space to be insulated.

Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to Piece No. 4.

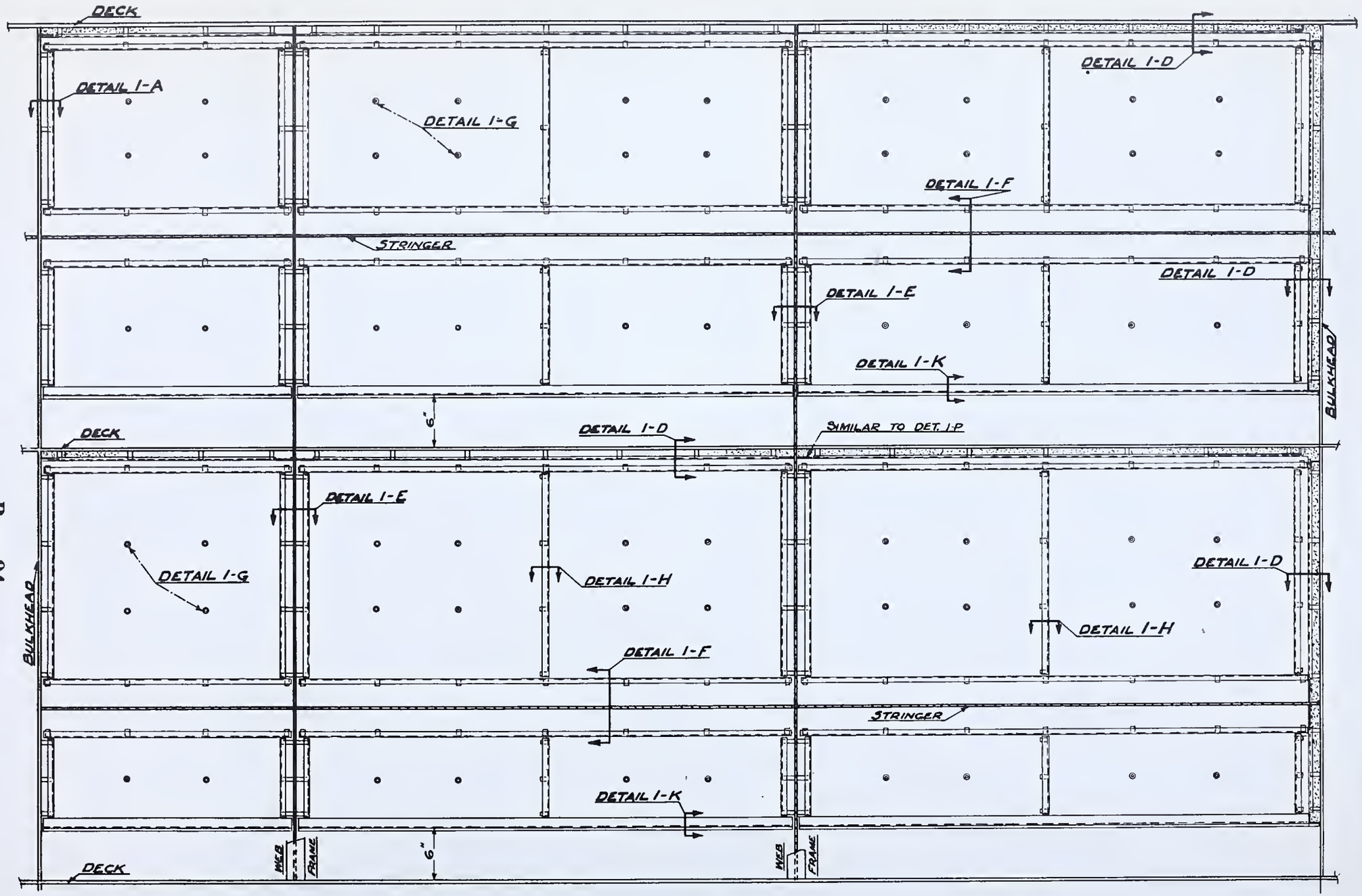
Piece No. 7 is a steel flat bar flanged to form a clip welded to the structure at intervals of about 12" ℄ - ℄

Piece No. 8, 9 or 10 is similar to Piece No. 7.

Piece No. 13 is a self-tapping screw, Type "F", connecting sheathing to Piece No. 33.

Piece No. 20 is a moulding for closing the corner formed by the vertical and horizontal sheathing.

Piece No. 33 is a steel plate forming the collar, which is cut to suit conditions.



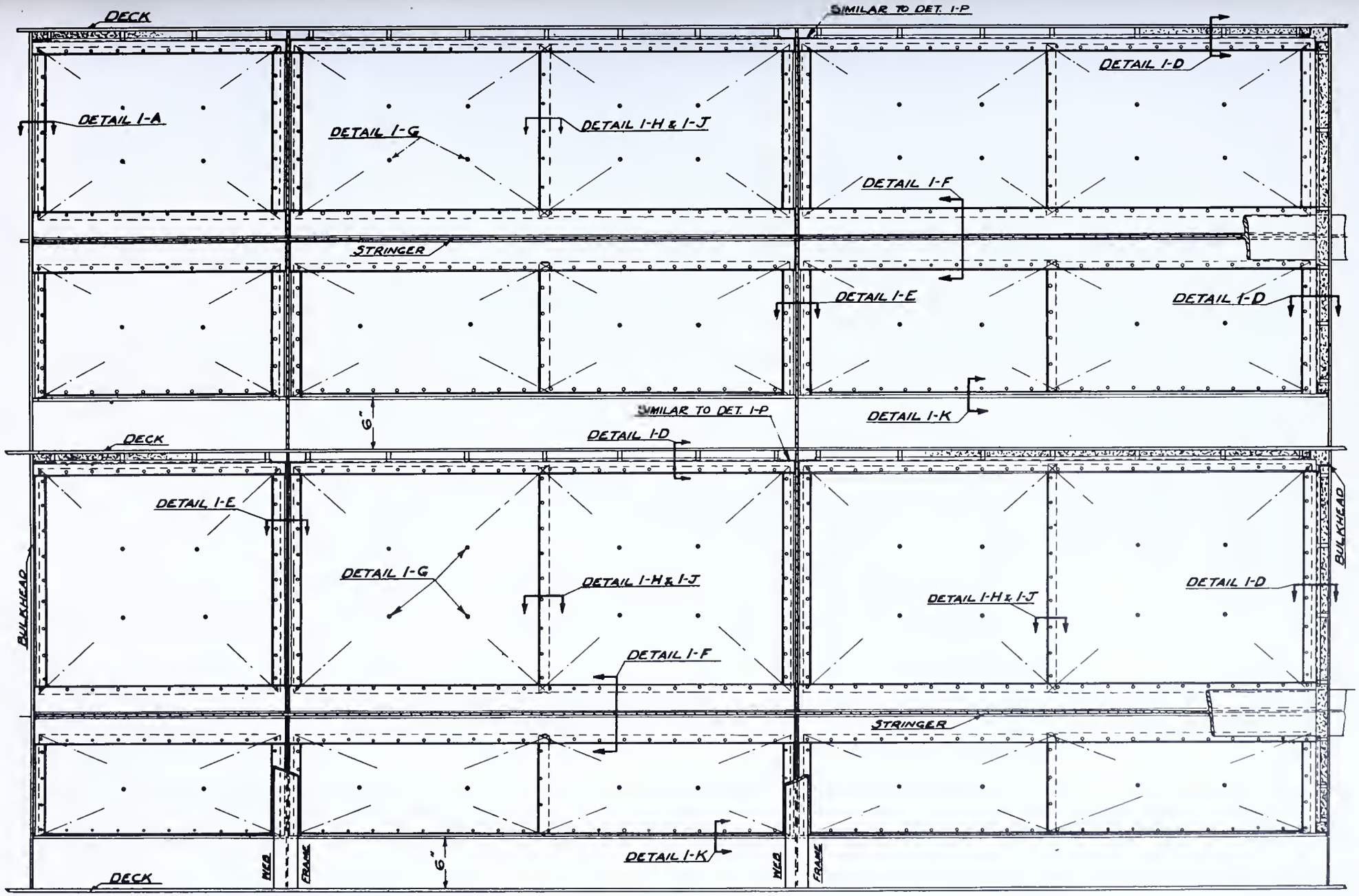
TYPICAL ELEVATION SHOWING LAYOUT OF BACKING SUPPORTS & QUILTING PINS FOR INSULATION AND ALUMINUM SHEATHING.
(CONDITION AT SHELL INDICATED.)

SCALE 1 2

DETAIL 1-M.

DESCRIPTION:

Showing the following Details as fitted in place complete, ready for templating sheathing forms:
1-A, 1-D, 1-E, 1-F, 1-G, 1-H, 1-K



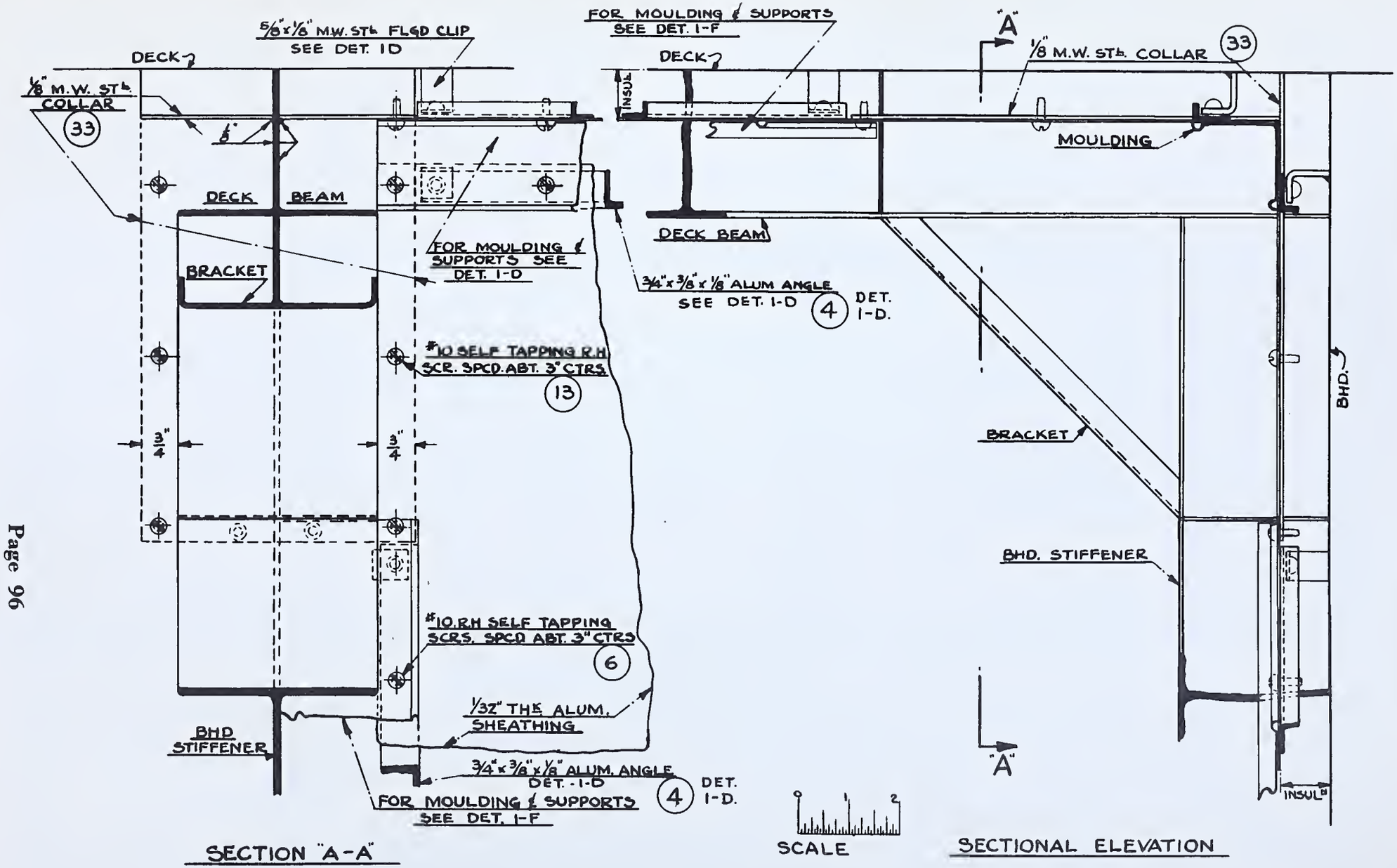
Typical Elevation Showing Layout of Aluminum Sheathing over Insulation.
(Condition at Shell Indicated.)

SCALE

Detail 1-N.

DESCRIPTION:

Showing the following Details as fitted complete, looking on face of sheathing:
1-A, D, E, F, G, H, J, K

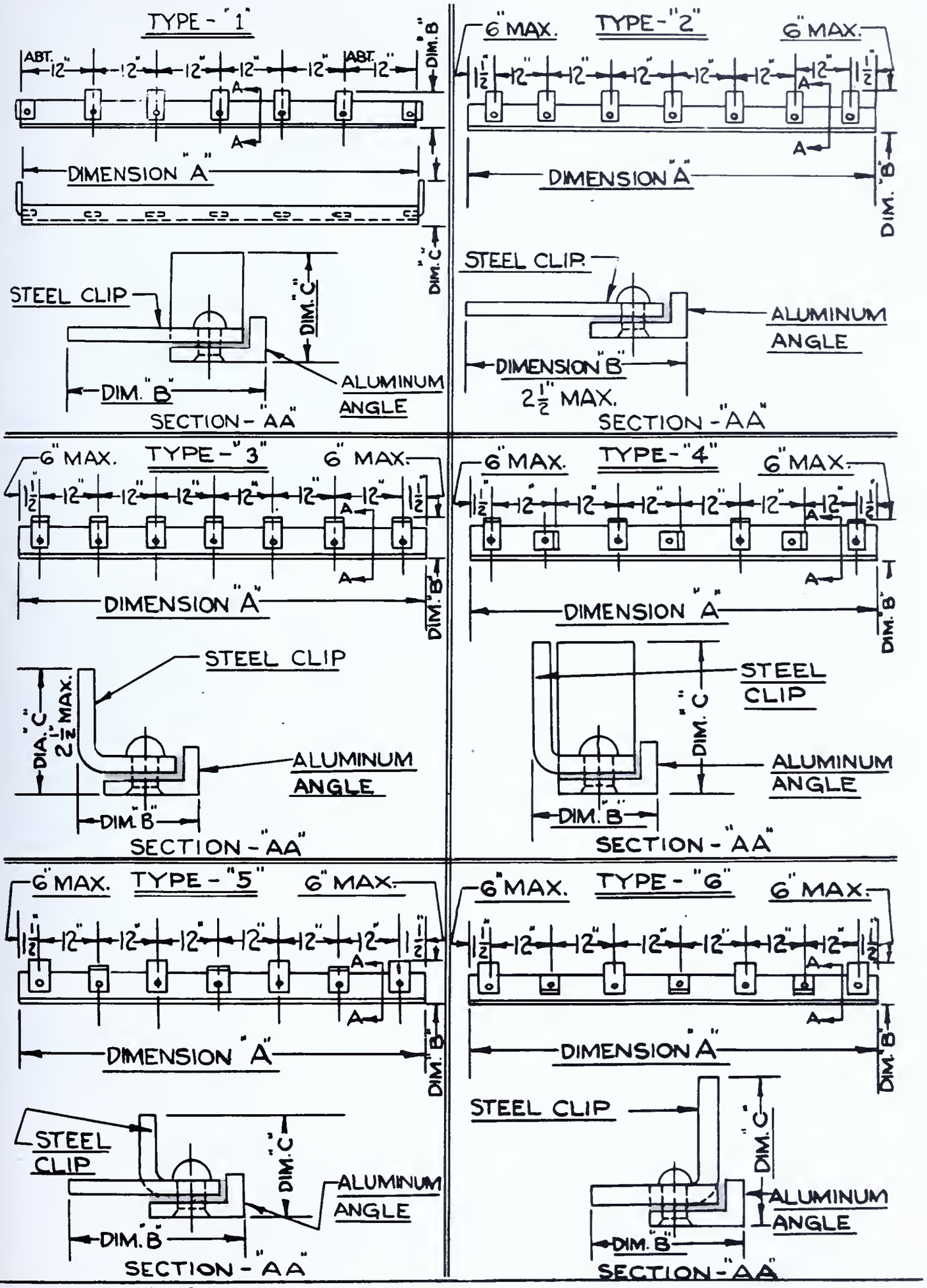


DESCRIPTION

Figures in circles are known as Piece Numbers.
Piece No. 6 is a self-tapping screw, type "A", connecting sheathing to collar.
Piece No. 13 is a self-tapping screw, type "F", connecting sheathing to collar.
Piece No. 33 is a plate forming a collar for sheathing connection.
Other particulars to be had from details as indicated.

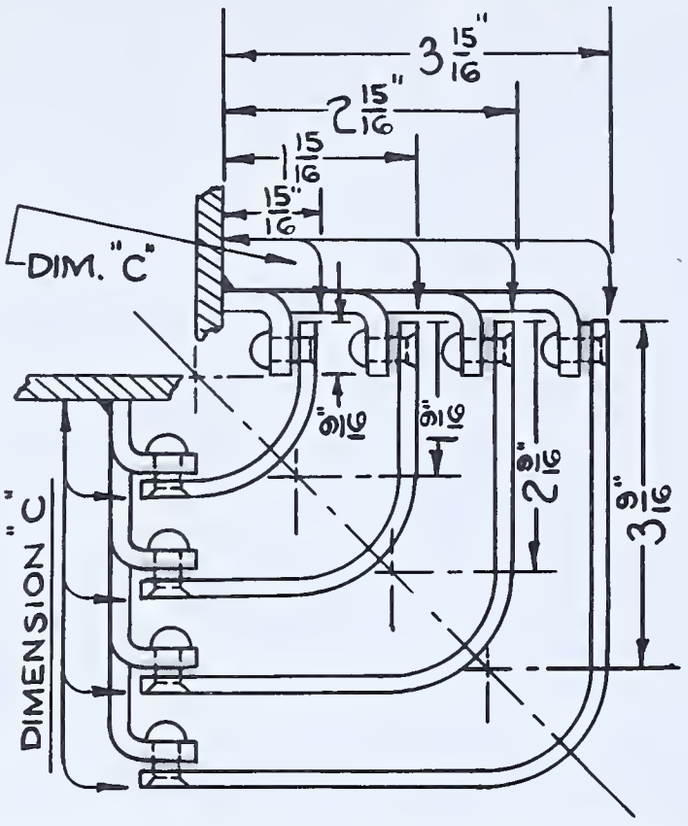
TYPICAL METHOD OF FITTING COLLARS FOR VERTICAL & HORIZONTAL INSULATION IN WAY OF BULKHEAD STIFFENER & DECK BEAM BRACKET CONNECTION.

DETAIL 1-P

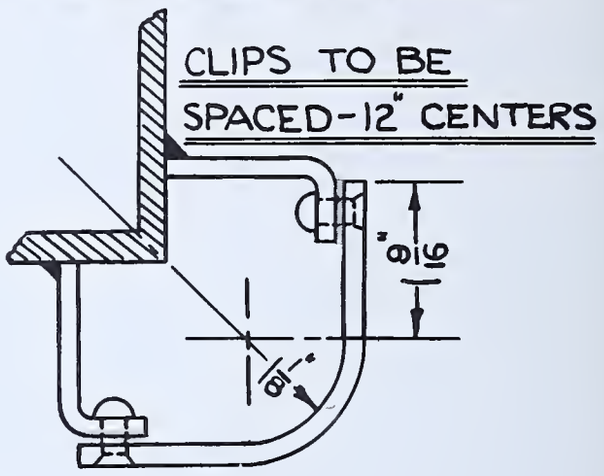


DETAIL 1-Q: ANGLE SUPPORT TYPES

CORNER PLATE AND FLANGED SHEET

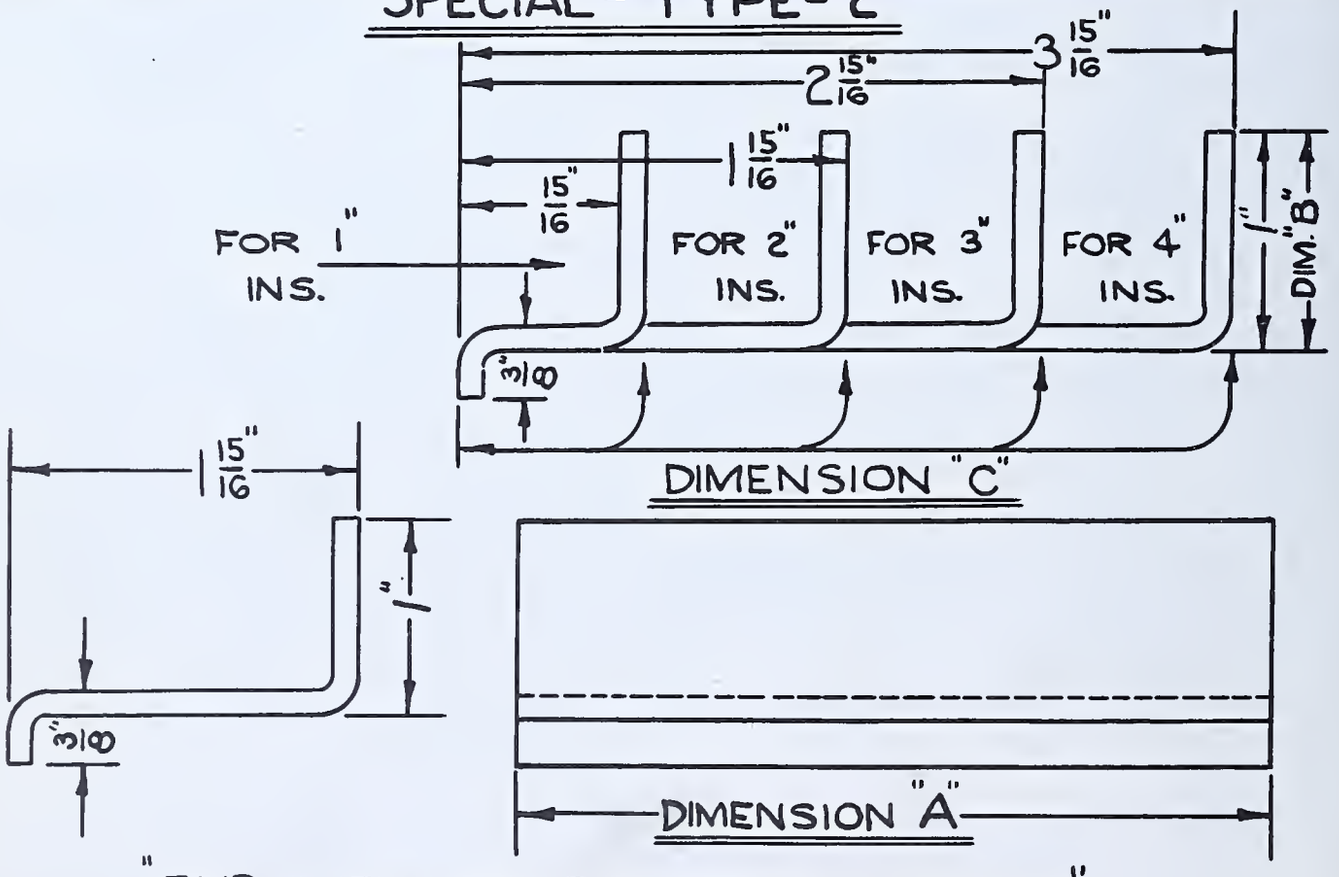


SPECIAL - TYPE - "1"



"CLIPS FOR INSULATION"

SPECIAL - TYPE - "2"



"END VIEW OF BOUNDARY ANGLE"

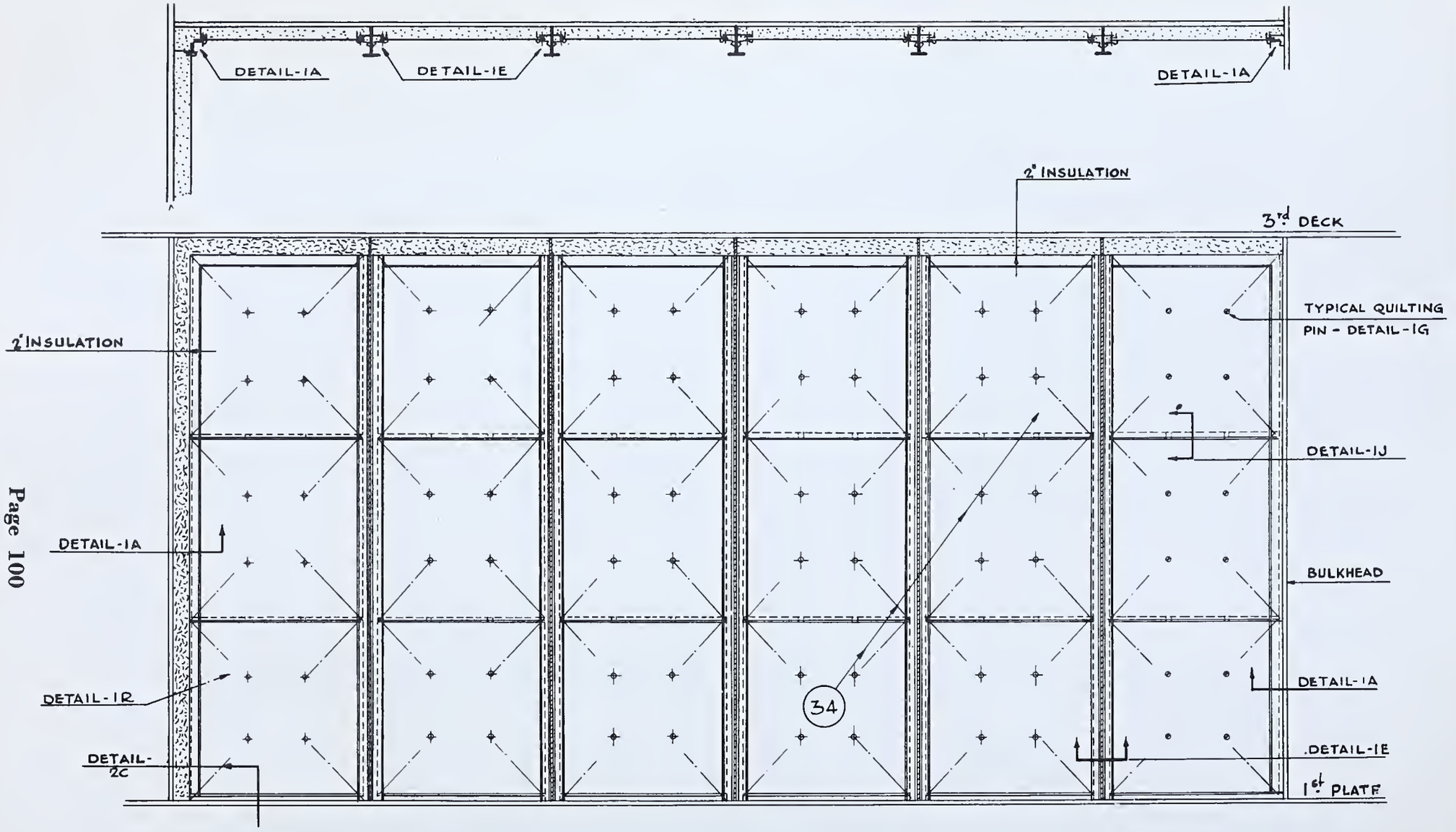
DETAIL - 1-R

·TYPICAL·

(FOR INSULATION)

·BILL OF MATERIAL..... QUANTITIES FOR ONE SHIP·

CHG Nº	Nº Pcs	NAME	MAT'L	PAT'N & DIE	N.D. SPEC.	REMARKS	DET. Nº & Pc Nº	Pc Nº
		F.B. CLIP	M.W. STL.		46-S-1 (INT) MAY 5, 1939	$\frac{5}{8}$" x $\frac{1}{8}$" FLAT BAR L=$1\frac{1}{4}$"	DET. 1A	1
		RIVET	M.W. STL.		43-R-5d	$\frac{3}{16}$" DIA B/CK L=$\frac{5}{8}$"	DET. 1A	2
		ALUMILASTIC	COMML.		COMML.	AS REQUIRED	DET. 1A	3
		ANGLE	ALUM.		46-A-10d	$\frac{3}{4}$" x $\frac{3}{8}$" x $\frac{1}{8}$" CUT & USE AS REQ'D	DET. 1H	4
		MOULDING	AL. 52 $\frac{1}{4}$ HARD		47-A-11b	48" x 10'-0" x .03215 ↓	DET. 1J	5
		SCREWS (L=$\frac{3}{8}$")	STEEL SHERAD.		COMML.	#10 - SELF TAPPING SCREWS SIM. TO PARKER KALON "A"	DET. 1A	6
		FLANGED CLIP	M.W.STL.		46-S-1 (INT) MAY 5, 1939	$\frac{5}{8}$" x $\frac{1}{8}$" FLAT BAR L=$1\frac{9}{16}$"	DET. 1H	7
		FLANGED CLIP	M.W.STL.		46-S-1 (INT) MAY 5, 1939	$\frac{5}{8}$" x $\frac{1}{8}$" FLAT BAR L=$2\frac{9}{16}$"	DET. 1H	8
		FLANGED CLIP	M.W.STL.		46-S-1 (INT) MAY 5, 1939	$\frac{5}{8}$" x $\frac{1}{8}$" FLAT BAR L=$3\frac{9}{16}$"	DET. 1H	9
		FLANGED CLIP	M.W.STL.		46-S-1 (INT) MAY 5, 1939	$\frac{5}{8}$" x $\frac{1}{8}$" FLAT BAR L=$4\frac{9}{16}$"	DET. 1H	10
		CORNER PLATE M.W. STEEL OR AL. 53 COND. "T"			47-A-11b	$\frac{1}{8}$" PL x 8" OR #14 USSG M.W. STEEL CUT & USE TO SUIT	DET. 1B	11
		FLAT BAR	M.W.STL.		46-S-1 (INT) MAY 5, 1939	$\frac{1}{4}$" x $\frac{1}{8}$" F.B. ↓	DET. 1C	12
		SCREW (L=$\frac{1}{2}$")	STEEL SHERAD.		COMML.	#10-SELF TAPPING SCREWS SIM TO PARKER KALON "F"	DET. 1K	13
		NUT	STEEL CAD. PLTD		42-S-5d	SPECIAL TO SUIT #12, 28 NF 2	DET. 1G	14
		QUILTING PIN	STEEL		47-S-5d	#12, 28 NF 2 L=$1\frac{7}{16}$"	DET. 1G	15
		QUILTING PIN	STEEL		47-S-5d	#12, 28 NF 2 L=$2\frac{7}{16}$"	DET. 1G	16
		QUILTING PIN	STEEL		47-S-5d	#12, 28 NF 2 L=$3\frac{7}{16}$"	DET. 1G	17
		QUILTING PIN	STEEL		47-S-5d	#12, 28 NF 2 L=$4\frac{7}{16}$"	DET. 1G	18
		WASHER	STEEL CAD. PLTD		42-S-5d	1" DIA x $\frac{1}{8}$" THK #12, 28 NF 2 THREAD FOR	DET. 1G	19
		MOULDING	AL. 52 $\frac{1}{4}$" HARD		47-A-11b	TAKE FROM Pc Nº 5 & CUTTINGS.	DET 1D	20
		FLANGED SHEET	SHEET STEEL		47-S-10d	#14 USSG x $2\frac{5}{16}$" L= TO CUT	DET. 1K	21
		FLANGED SHEET	SHEET STEEL		47-S-10d	#14 USSG x $3\frac{5}{16}$" L= TO CUT	DET. 1K	22
		FLANGED SHEET	SHEET STEEL		47-S-10d	#14 USSG x $4\frac{5}{16}$" L= TO CUT	DET. 1K	23
		FLANGED SHEET	SHEET STEEL		47-S-10d	#14 USSG x $5\frac{5}{16}$" L= TO CUT	DET. 1K	24
		SHEATHING	$\frac{1}{4}$ AL. 52 HARD		47-A-11b	36" x 2'-2" x .03125" THK.		25
		SHEATHING	$\frac{1}{4}$ AL 52 HARD		47-A-11b	36" x 4'-2" x .03125" THK.		26
		SHEATHING	$\frac{1}{4}$ AL 52 HARD		47-A-11b	48" x 4'-2" x .03125" THK.		27
		SHEATHING	$\frac{1}{4}$ AL 52 HARD		47-A-11b	18" x 22" x .03125" THK.		28
		INSULATION	FIBROUS GLASS		32-G-2b	BATS 24" x 48" 1" THK. DENSITY-$1\frac{1}{2}$ Lb. P/C FT		29
		INSULATION	FIBROUS GLASS		32-G-2b	BATS 24" x 48" 2" THK. DENSITY-$1\frac{1}{2}$ lb. P/C FT.		30
		INSULATION	FIBROUS GLASS		32-G-2b	BATS 24" x 48" 3" THK. DENSITY $1\frac{1}{2}$ lb. P/C FT.		31
		INSULATION	FIBROUS GLASS		32-G-2b	BATS 24" x 48" 4" THK. DENSITY $1\frac{1}{2}$ lb P/C FT		32
		COLLAR	M.W. STEEL		46-S-1 (INT) MAY 5, 1939	$\frac{1}{8}$" x 48" x 6'-0" L= TO CUT	DET. 1L	33
		SHEATHING	NICKEL COPPER ALLOY	PERFORATED: SEE DET. 2B.	46-M-7f	.002" x 48" x 6'-0" LG TO CUT	DET. 2B	34
		FLANGED STRIP	SHEET STEEL		47-S-10d	#14 U.S.S.G. x $1\frac{1}{2}$" L= TO CUT	DET. 2C	35
		FLAT BAR	M.W.STL.		46-S-1 (INT) MAY-5-1939	4" x $\frac{3}{8}$" FLAT BAR TO CUT	DET. 2D	36
		FLANGED PLATE	M.W.STL.		48-S-1 MAR.-30-39	3" x $\frac{1}{8}$" PL LGTH. TO SUIT	DET. 2D	37

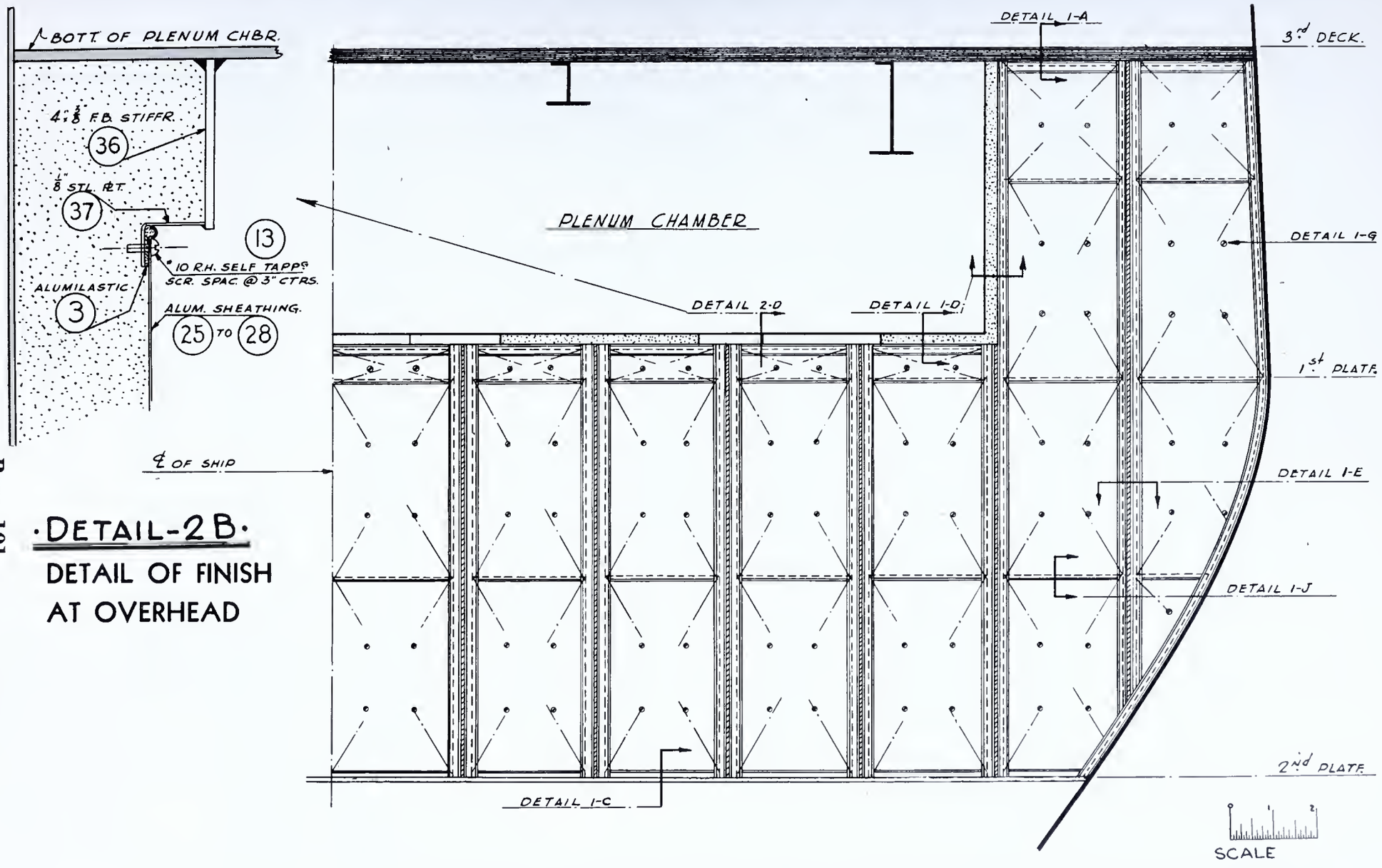


SCALE

TRANSV. BHD. LOOKING AFT.

2" FIBERGLASS INSULATION SHEATHED WITH .022 PERFORATED NICKEL COPPER ALLOY

·DETAIL-2A·

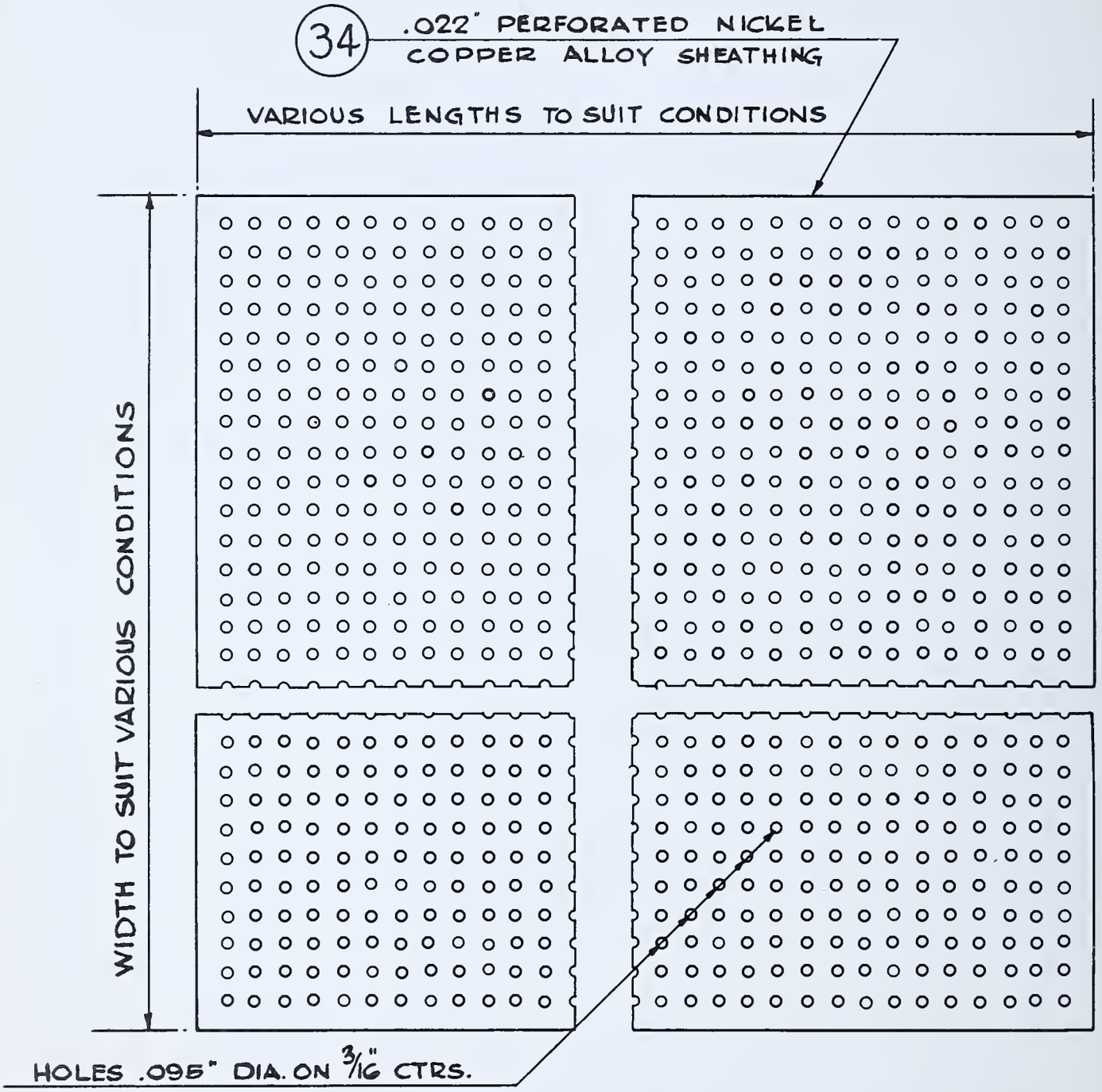


·DETAIL-2B·

DETAIL OF FINISH
AT OVERHEAD

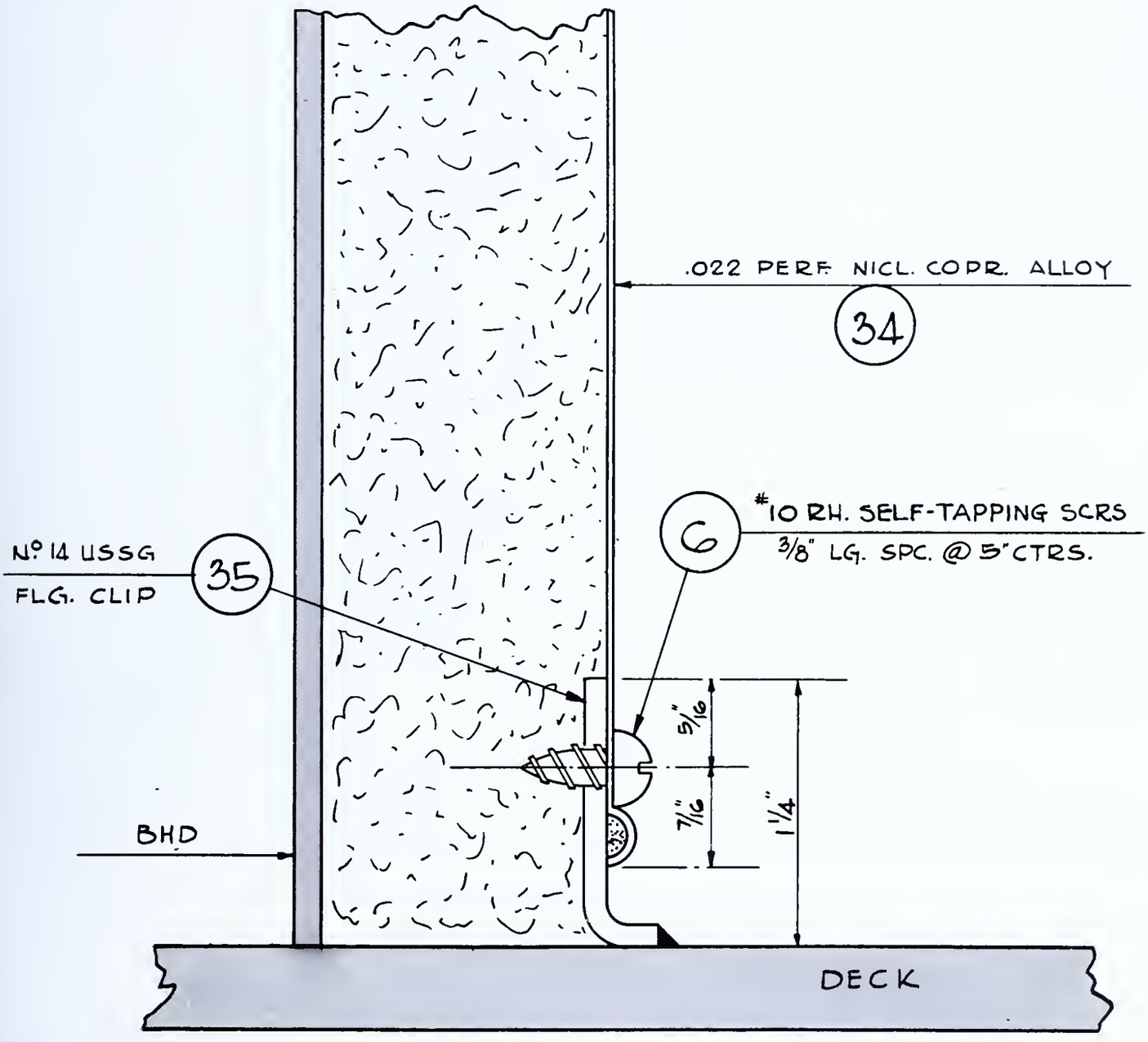
DETAIL 2C·— TYPICAL LAYOUT OF BULKHEAD FOR HEAT INSULATION

TRANSVERSE BULKHEAD LOOKING AFT


34
.022" PERFORATED NICKEL COPPER ALLOY SHEATHING
VARIOUS LENGTHS TO SUIT CONDITIONS
WIDTH TO SUIT VARIOUS CONDITIONS
HOLES .095" DIA. ON 3/16" CTRS.

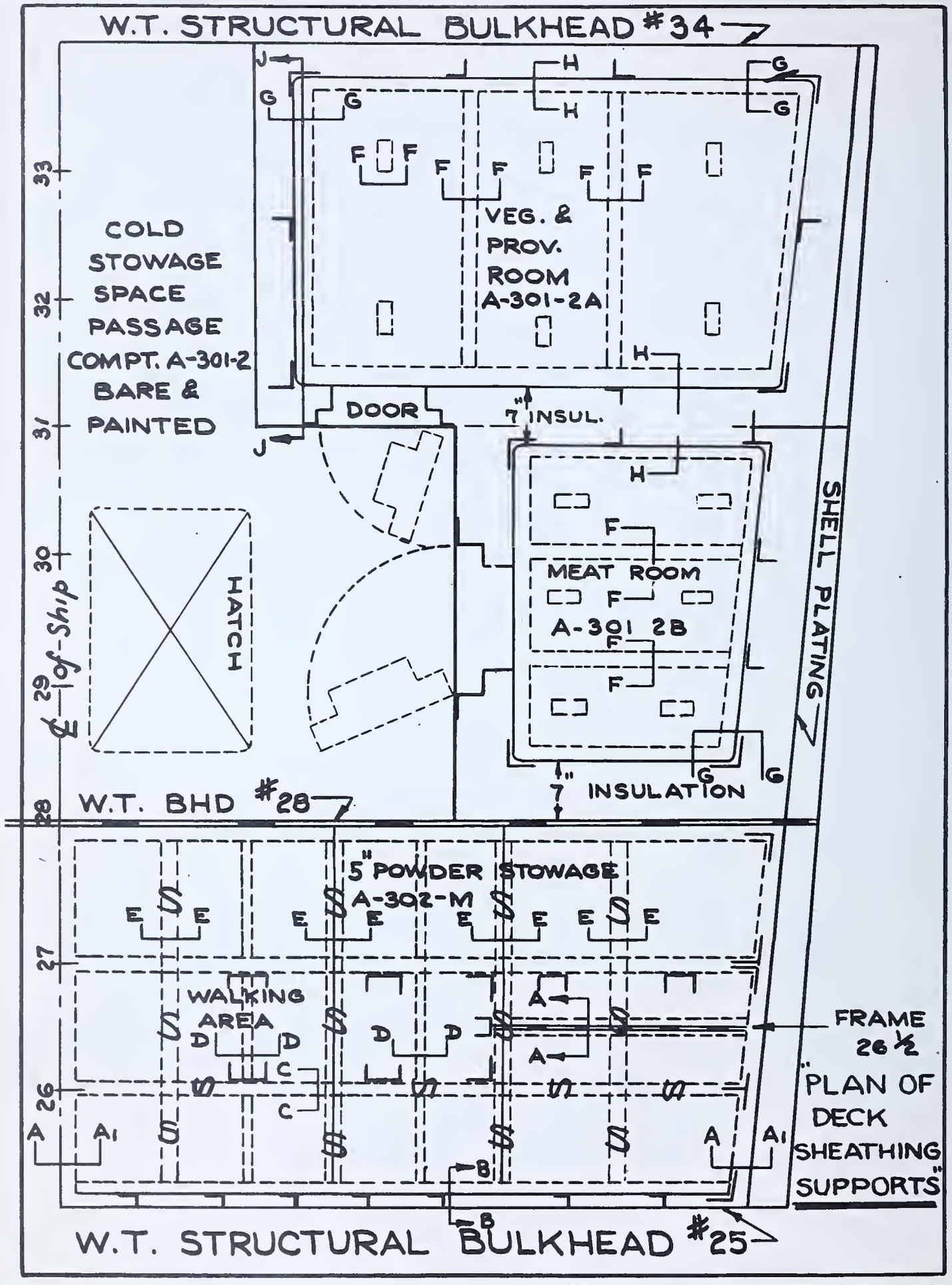
SOUND ABSORPTION PERFORATED SHEATHING.

.DETAIL-2D.



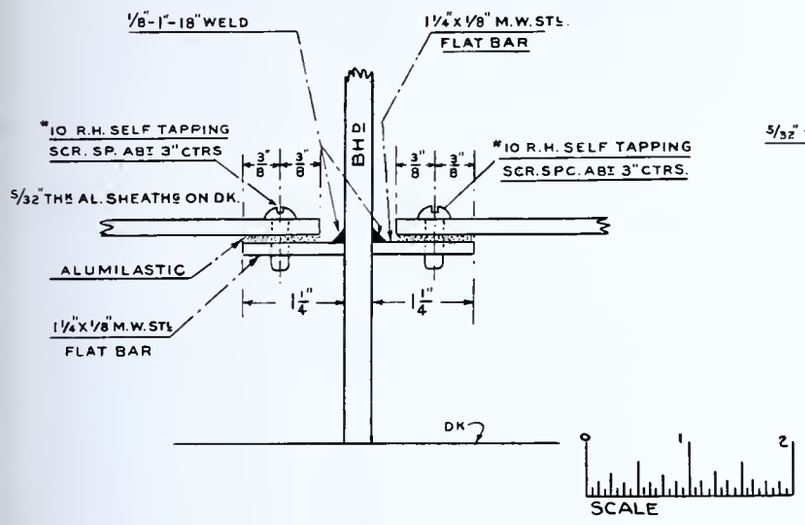
· TYPICAL DETAIL WHERE INSULATION AT BOTTOM · · IS CARRIED TO DECK ·

· DETAIL - 2E ·



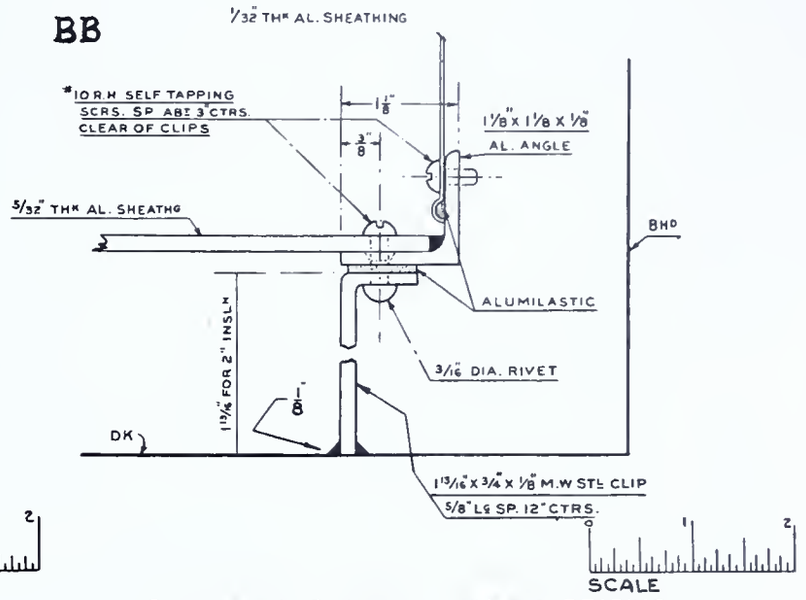
DRAWING 3-A: COLD STOWAGE AND AMMUNITION STOWAGE AREA

AA


1/8"-1"-18" WELD
1¼"x1/8" M.W. STL. FLAT BAR
*10 R.H. SELF TAPPING SCR. SP. ABT 3" CTRS
*10 R.H. SELF TAPPING SCR. SPC. ABT 3" CTRS.
5/32" THK AL. SHEATHG ON DK.
ALUMILASTIC
1¼"x1/8" M.W. STL. FLAT BAR
BHD
DK
SCALE

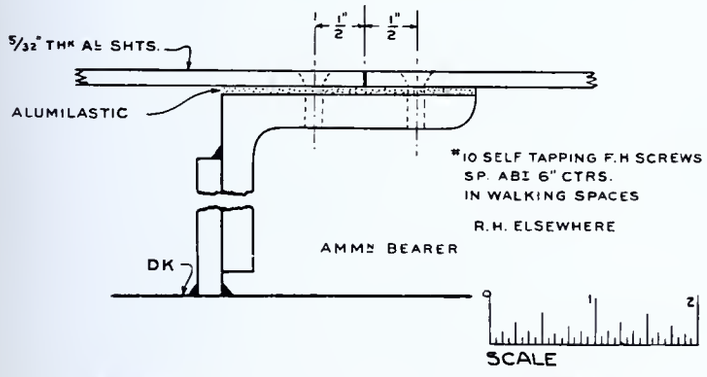
DECK SHEATHING BULKHEAD BOUNDARY CONNECTION

BB


1/32" THK AL. SHEATHING
*10 R.H SELF TAPPING SCRS. SP ABT 3" CTRS. CLEAR OF CLIPS
1⅛"x1⅛x⅛" AL. ANGLE
5/32" THK AL. SHEATHG
BHD
ALUMILASTIC
3/16" DIA. RIVET
1 13/16" FOR 2" INSLN
DK
1 13/16"x¾"x⅛" M.W STL CLIP 5/8" LG SP. 12" CTRS.
SCALE

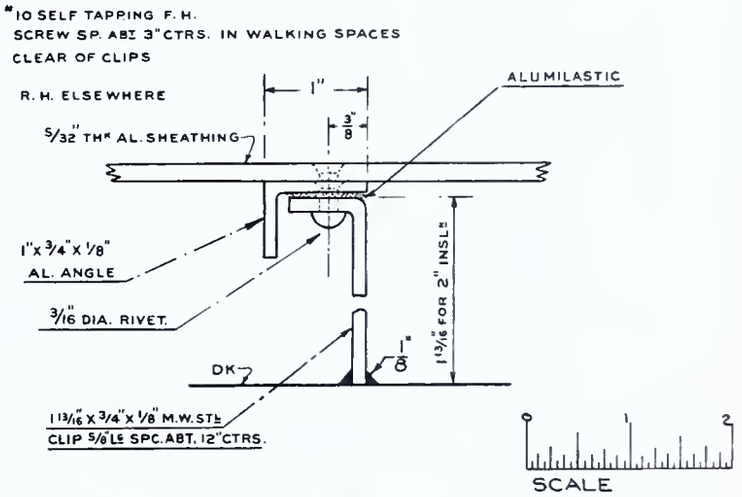
BOUNDARY SUPPORT WHERE BEARING MEETS VERTICAL INSULATION

CC



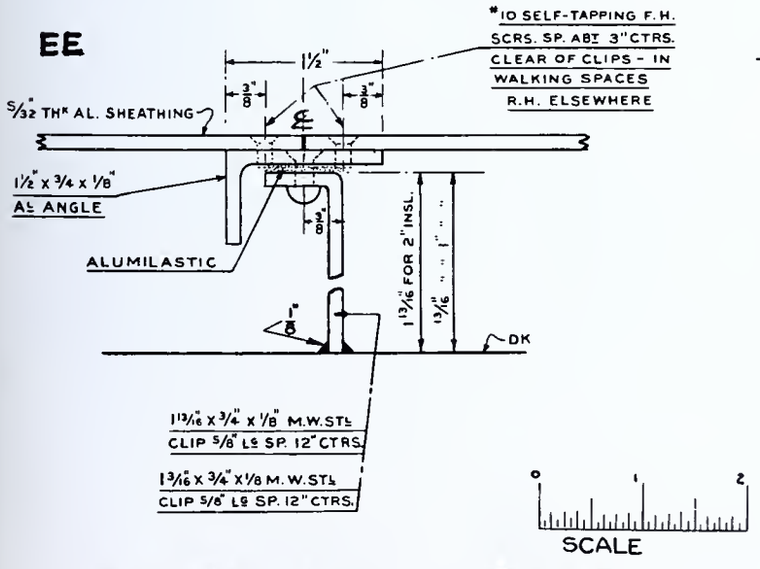
DECK SHEATHING – BUTT LAP ON AMM^N. BEARER

DD


*10 SELF TAPPING F.H. SCREW SP. ABT 3" CTRS. IN WALKING SPACES CLEAR OF CLIPS
R.H. ELSEWHERE
5/32" THK AL. SHEATHING
ALUMILASTIC
1"x¾"x⅛" AL. ANGLE
3/16" DIA. RIVET.
1 13/16" FOR 2" INSLN
DK
1 13/16" X ¾" x ⅛" M.W. STL CLIP 5/8" LG SPC. ABT. 12" CTRS.
SCALE

DECK SHEATHING SUPPORT BETWEEN AMM^N. BEARERS

EE


*10 SELF-TAPPING F.H. SCRS. SP. ABT 3" CTRS. CLEAR OF CLIPS – IN WALKING SPACES R.H. ELSEWHERE
5/32" THK AL. SHEATHING
1½" x ¾ x ⅛" AL. ANGLE
ALUMILASTIC
1 13/16" FOR 2" INSL.
DK
1 13/16" x ¾" x ⅛" M.W. STL CLIP 5/8" LG SP. 12" CTRS.
1 3/16" x ¾" x ⅛ M.W. STL CLIP 5/8" LG SP. 12" CTRS.
SCALE

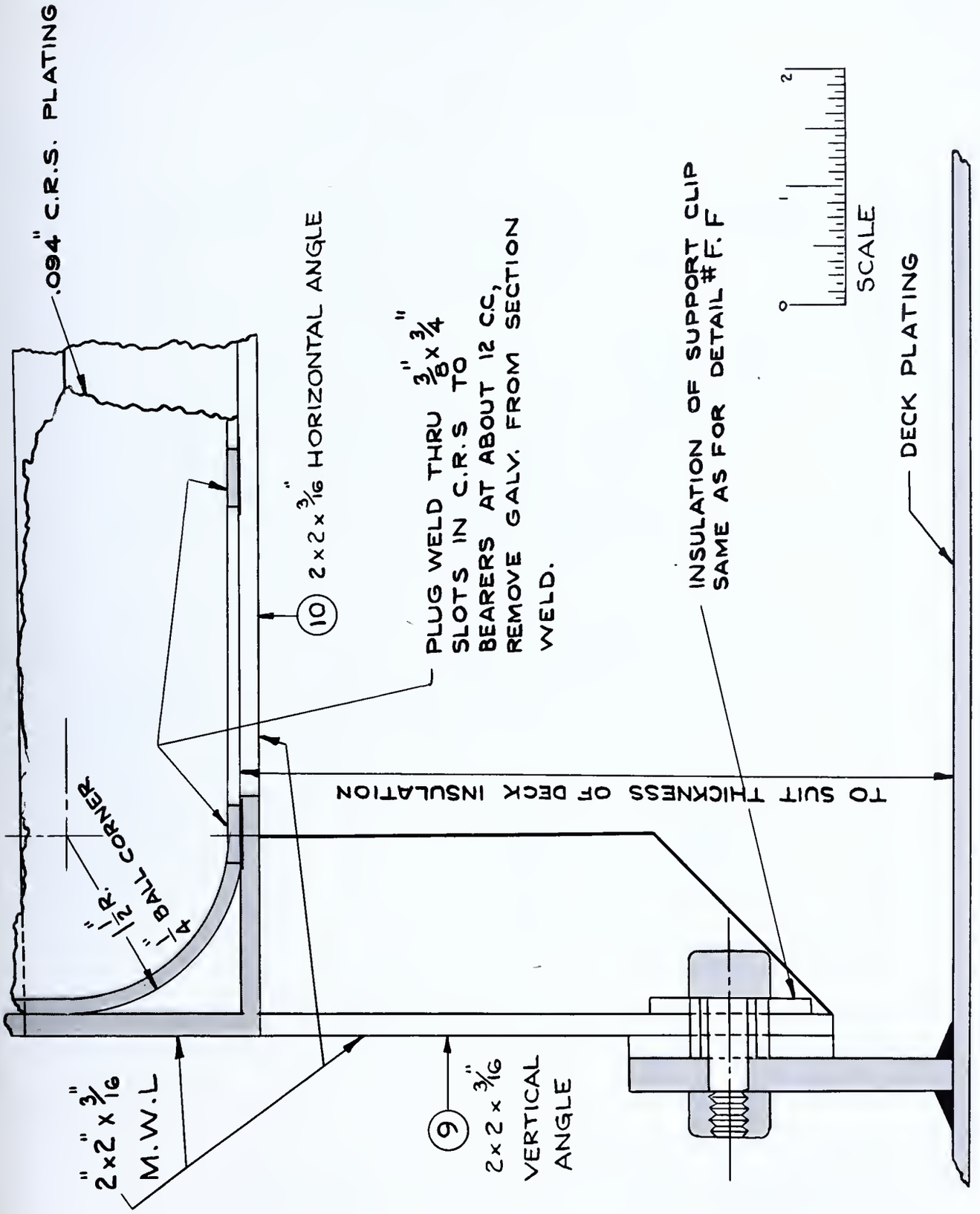
DECK SHEATHING BUTT LAP SUPPORT BETWEEN OR CLEAR OF AMM^N. BEARER

DRAWING 3-B

DETAILS OF AMMUNITION DECK SHEATHING SUPPORTS IN AMMUNITION STOWAGE

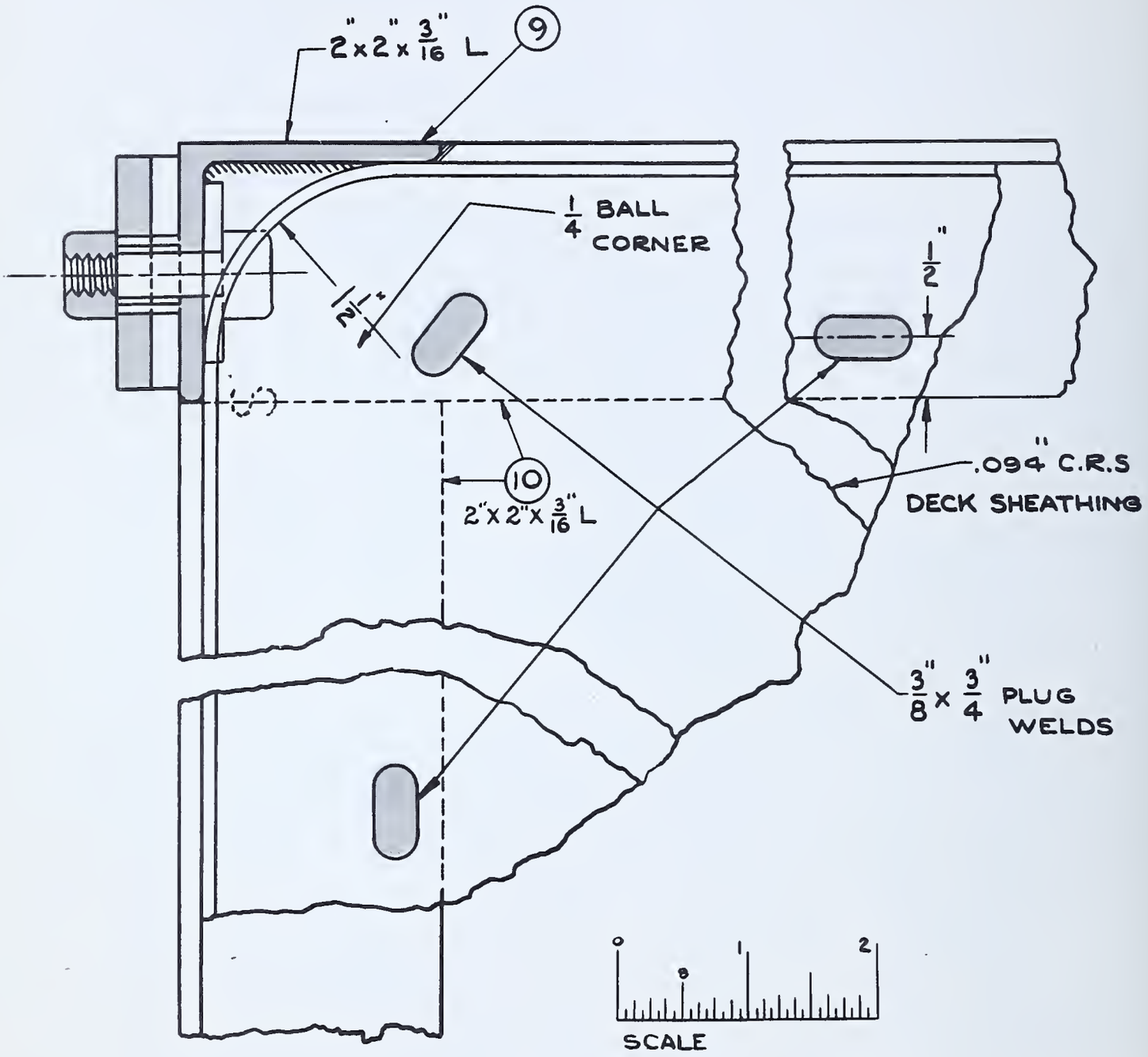
ELEVATION OF SECTION FF - DECK SHEATHING SUPPORT

1. "SHEATHING — .094 CORROSION RESISTING STEEL PLATE.
2. "BEARER" — $1\frac{1}{2}$" x 2" x $\frac{3}{16}$" M.W. STEEL ANGLE BEARER.
3. 2 — $\frac{3}{8}$" DIAM. BOLTS — $1\frac{3}{4}$" LONG $\frac{3}{8}$" DIAM. x $1\frac{1}{8}$" LG. MACH. BOLTS STEEL GALV.
4. "NUT" — $\frac{3}{4}$" DIAM. $\frac{3}{8}$" U.S.S.T. HEX NUTS.
5. "FERRULE" — $\frac{13}{32}$" I.D. x $\frac{21}{32}$" O.D. x $\frac{3}{8}$" LONG FIBRE FERRULE.
6. "BLOCK" — $\frac{3}{16}$" x $1\frac{11}{16}$" x 2" FIBRE BLOCK.
7. "WASHER" — $\frac{1}{16}$" I.D. x $1\frac{3}{8}$" O.D. x $\frac{1}{8}$" THICK FIBRE WASHER.
8. SUPPORT CLIP — $\frac{1}{4}$" x $3\frac{1}{2}$" x $5\frac{11}{16}$" LONG M.W.S. GALV. CLIP


.094" C.R.S. PLATING
10 2 x 2 x 3/16" HORIZONTAL ANGLE
PLUG WELD THRU 3/8" x 3/4" SLOTS IN C.R.S TO BEARERS AT ABOUT 12 C.C, REMOVE GALV. FROM SECTION WELD.
INSULATION OF SUPPORT CLIP SAME AS FOR DETAIL # F. F
0 1 2
SCALE
DECK PLATING
TO SUIT THICKNESS OF DECK INSULATION
1/2" R. CORNER
1/4" BALL
2 x 2 x 3/16" M.W.L
9 2 x 2 x 3/16" VERTICAL ANGLE

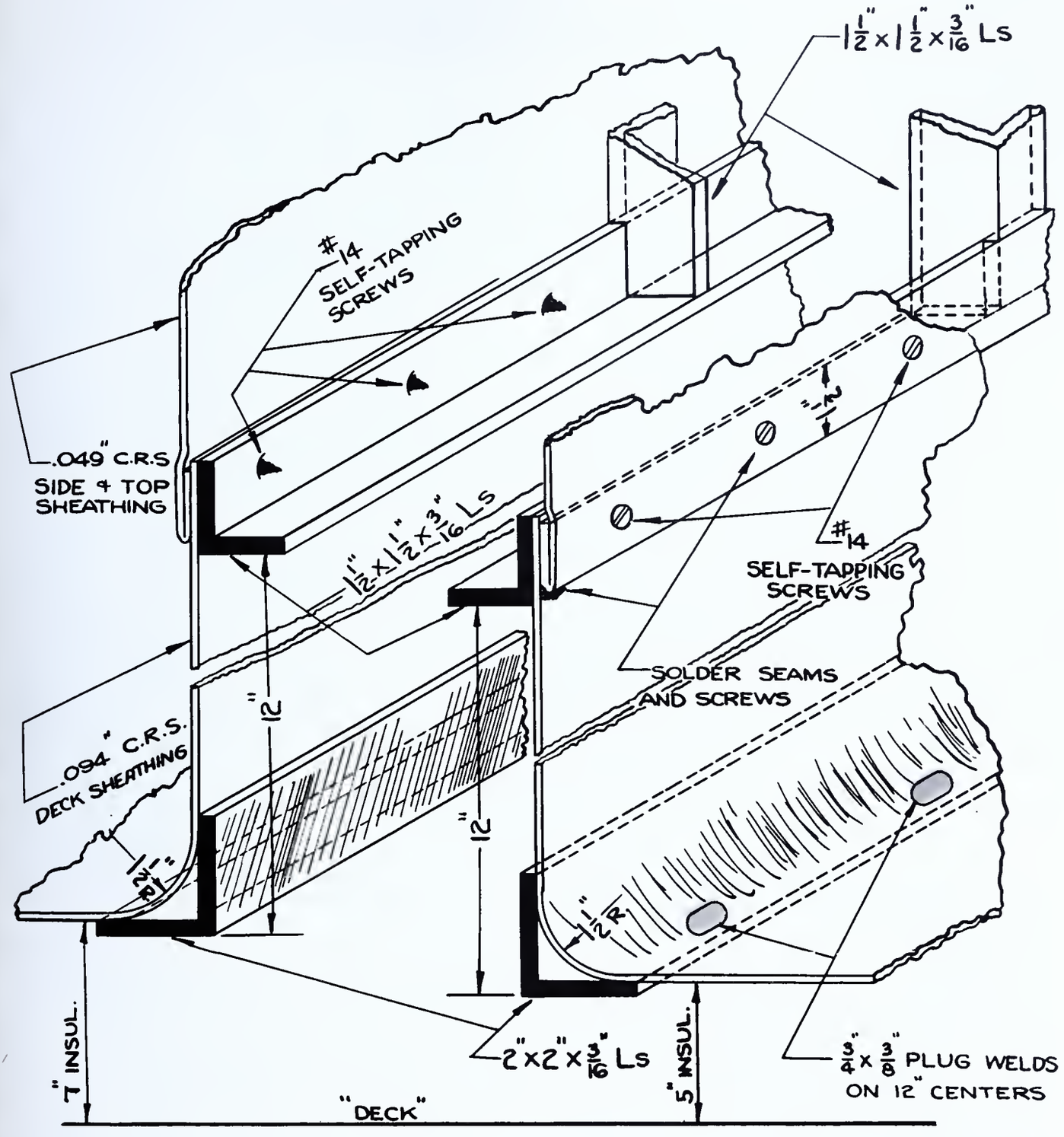
"GG"

ELEVATION OF CORNER — COLD STOWAGE AREA
SHOWING METHOD OF CORNER ANGLE AND DECK SUPPORT



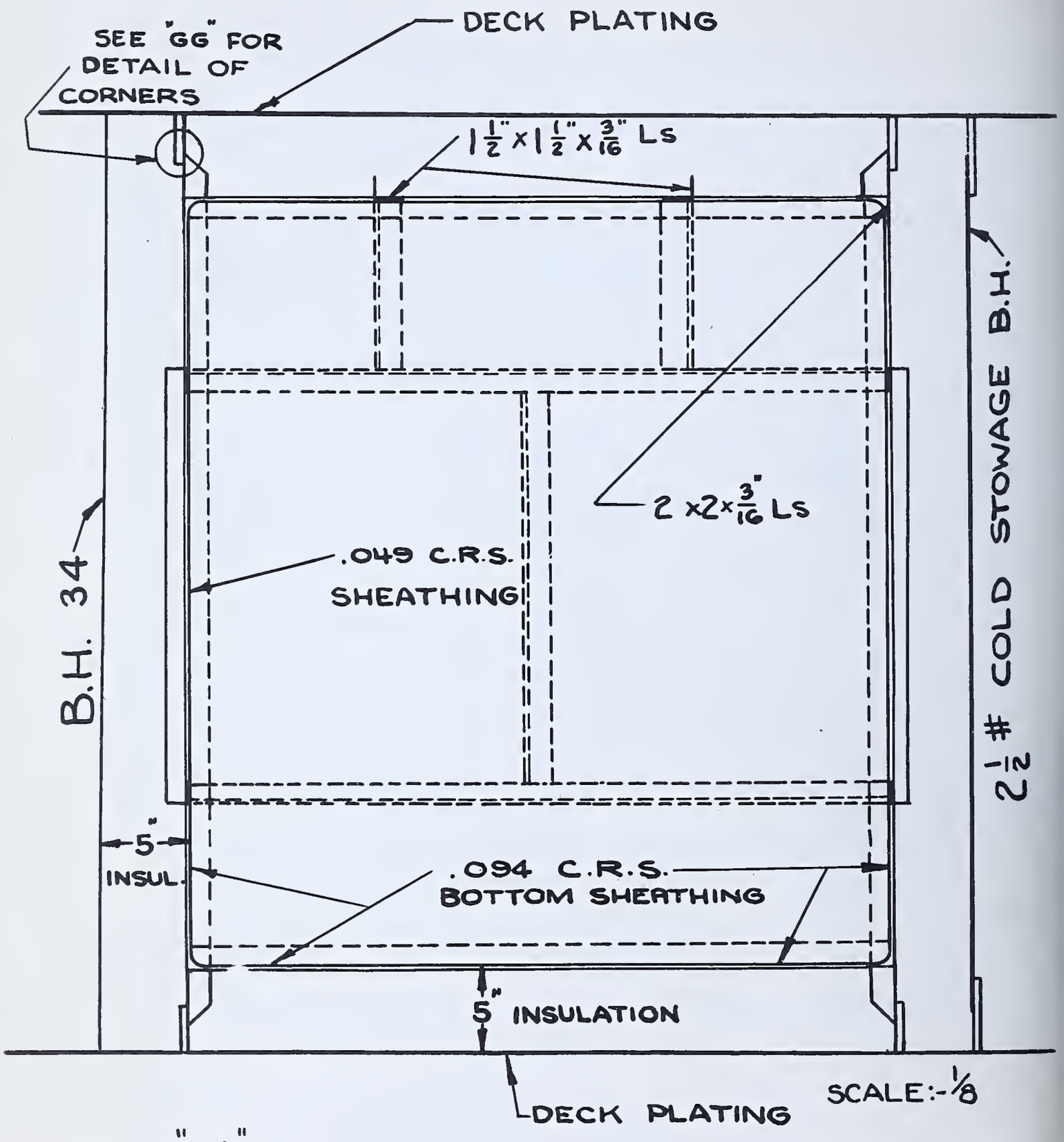
"GG"2

PLAN OF CORNER — COLD STOWAGE AREA



"PLAN OF SECTION "HH"

SECTION COLD STOWAGE PARTITION



"JJ"

"SECTION OF END OF REFRIGERATOR ROOM"